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NATIONAL DAM SAFETY PROGRAM. SALMON RIVER RESERVOIR DAM (INVENT--ETC(U)
SEP 78 J B STETSON DACW51-78-C-0035

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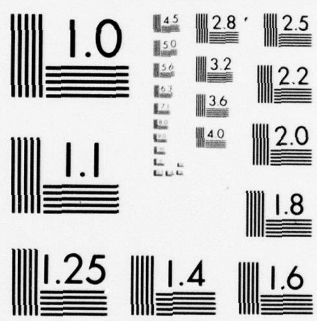

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

LEVEL II

SALMON RIVER BASIN

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NW

SALMON RIVER RESERVOIR DAM

OSWEGO COUNTY NEW YORK

INVENTORY № 374

PHASE I INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

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CONTRACT NO. DACW 51-78-C-0035

NEW YORK DISTRICT CORPS OF ENGINEERS

SEPTEMBER 1978

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)

Salmon River Basin
Salmon River Reservoir Dam
Oswego County, New York
Iventory No. N.Y. 374

5. TYPE OF REPORT & PERIOD COVERED

Phase I Inspection Report
National Dam Safety Program

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)

10 10 John B./Stetson

8. CONTRACT OR GRANT NUMBER(s)

15 DACW-51-78-C-0035

9. PERFORMING ORGANIZATION NAME AND ADDRESS

Dale Engineering Company
Bankers Trust Building
Utica, New York

12 256p.

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11

11. CONTROLLING OFFICE NAME AND ADDRESS

New York State Department of Environmental Conservation/ 50 Wolf Road
Albany, New York 12233

12. REPORT DATE

29 September 1978

13. NUMBER OF PAGES

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

Department of the Army
26 Federal Plaza/ New York District, CofE
New York, New York 10007

15. SECURITY CLASS. (of this report)

UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; Distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

NY

6 National Dam Safety Program. Salmon River Reservoir Dam (Inventory Number 374). Oswego County, New York. Phase I Inspection Report.

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Oswego County
Salmon River
Salmon River Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Additional investigation and removal of vegetation was recommended for Salmon River Dam.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam Salmon River Dam and Dikes NY374

State Located New York
County Located Oswego
Stream Salmon River
Date of Inspection September 12, 1978

ASSESSMENT OF GENERAL CONDITIONS

The Salmon River Dam is a concrete gravity structure approximately 725 feet long. The dam consists of an ungated spillway section approximately 244 feet long on the north end of the dam and a gated section approximatley 256 feet long on the south side. The dam is 60 feet high. The Salmon River Reservoir is also impounded by three earthen dikes located near the opposite end of the reservoir from the main dam. The dikes measure from a 100 feet to 1330 feet in length. Their height is a maximum of 13 feet. The facility is used as a storage impoundment for hydro-power production. Since the storage capacity of the dam exceeds 50,000 acre feet, the dam is in the Large Dam Category. The location of numerous small hamlets downstream places the dam in the High Hazard Category. The drainage area of the dam is 193 square miles, the surface area of the reservoir is 43 square miles.

Both the spillway capacity and structural stability of the dam were evaluated. The spillway, gated and ungated, combine to provide 60 to 70 percent of the Probable Maximum Flood (PMF) discharge capacity. Since this capacity is greater than 50 percent of the PMF with the gates in operation, then according to the Corps of Engineers screening criteria, the spillway has been found to be inadequate but not seriously inadequate.

The stability analysis indicates the gravity dam structure retains stability against overturning and sliding for the conditions assumed, i.e., reservoir level at flashboard elevation with uplift and seismic forces acting.

The major area of concern is the general condition of the earth dikes which are inaccessible for routine inspections and heavily overgrown with brush and trees. Because of the potential damage to these earthen embankments, this dam has been given a yellow cover in the Phase I investigation. It is recommended action be taken prior to the reported (by owners) 1980 programmed work to raise the dikes. In the interim, because of the potential damage to earth structures caused by trees being uprooted in high wind storms, it is recommended to have the clearing and grubbing work (keeping the embankments stabilized) necessary for increasing the dike sections to be accomplished as soon as is practical.

The service road to the dikes and along the dikes should be put back into operation for routine visual inspection. Where large trees may be involved in the removal effort, it is recommended that the trees be cut, but tree stumps should be left in place during this interim period. For a longer period, seepage paths may develop along the root systems, therefore, earthwork to be performed on the dikes should include proper removal of the trunks and root system. Since the dikes were inspected with no head on then, it is recommended that this report be amended after the dikes have been inspected by a professional engineer under condition of significant head.

STATE OF NEW YORK
DALE ENGINEERING COMPANY, INCORPORATED
NO. 076
LICENSED PROFESSIONAL ENGINEER

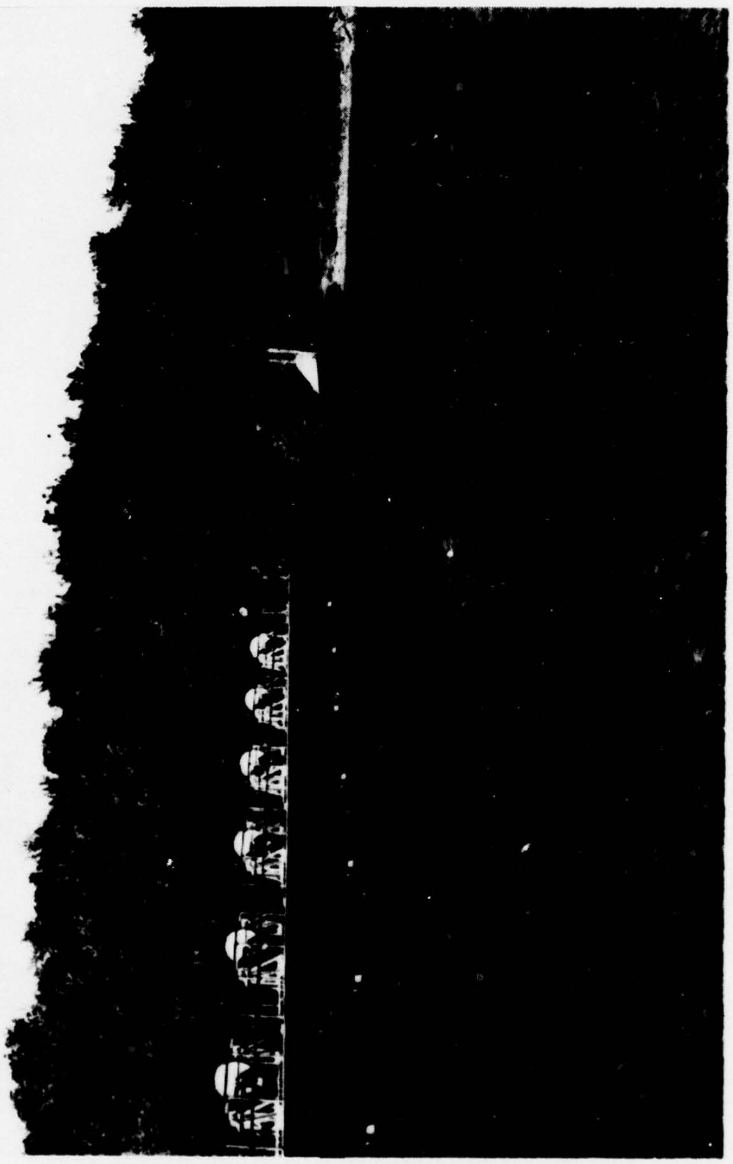
Dale Engineering Company

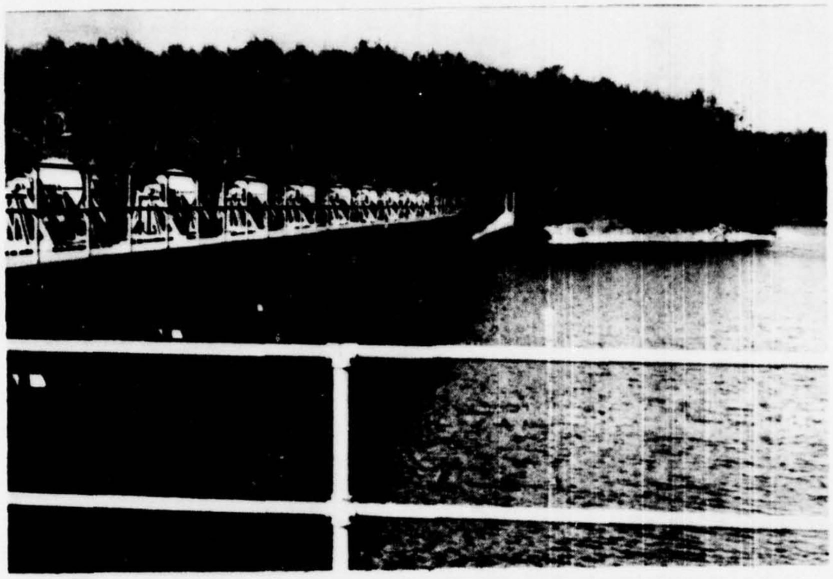
John B. Stetson

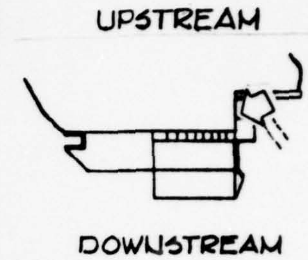
John B. Stetson, President

Approved By:
Date: 29 September 78

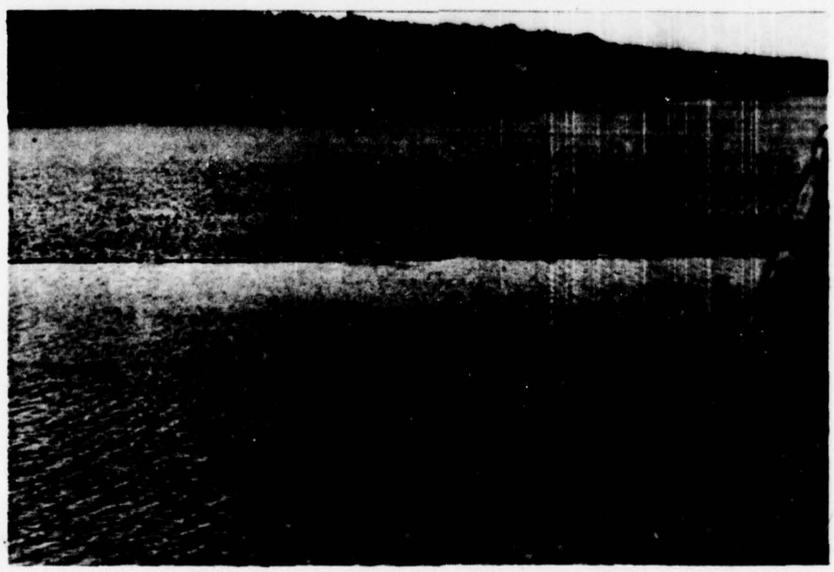
Col. Clark H. Benn
New York District Engineer

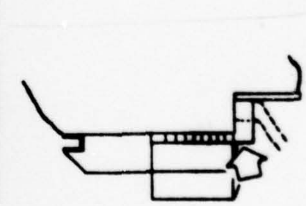




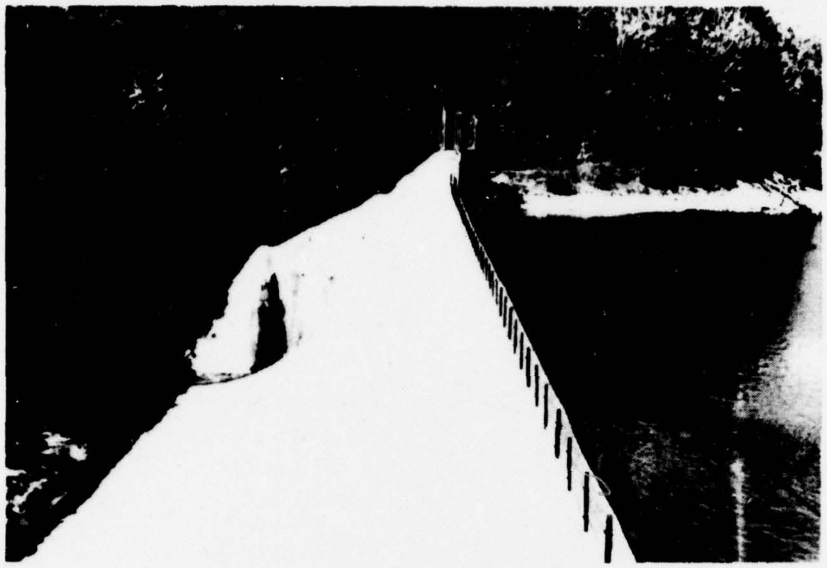


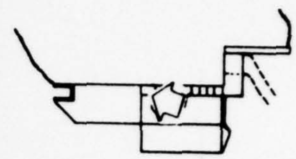
1. View across upstream face of dam showing tainter gate section in foreground and ungated spillway with flashboards in background.



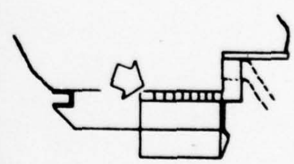


2. View looking onto the reservoir; notice log boom across center of picture.

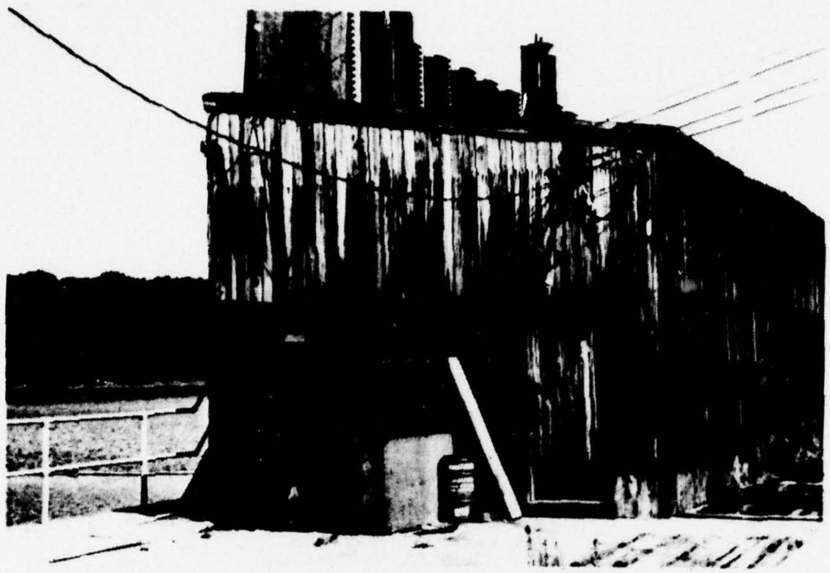


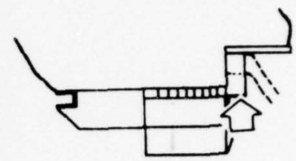


3. Closeup of ungated spillway which has recently been capped.

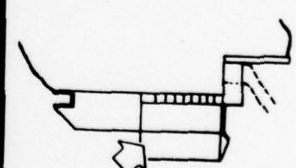


4. View opposite from location in Picture #3 showing downstream face of dam at gated spillway section.

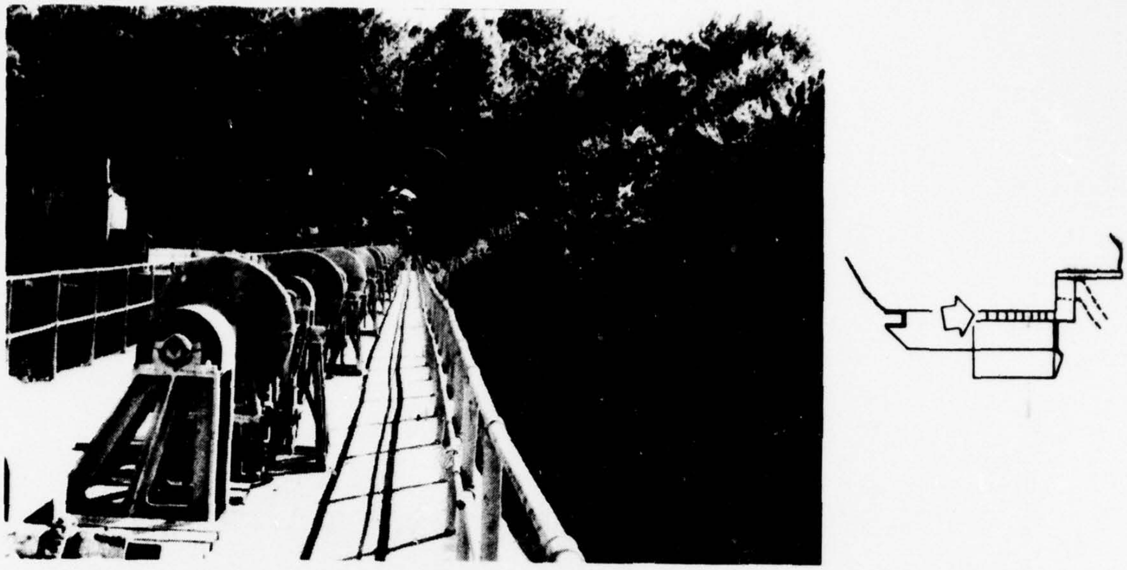




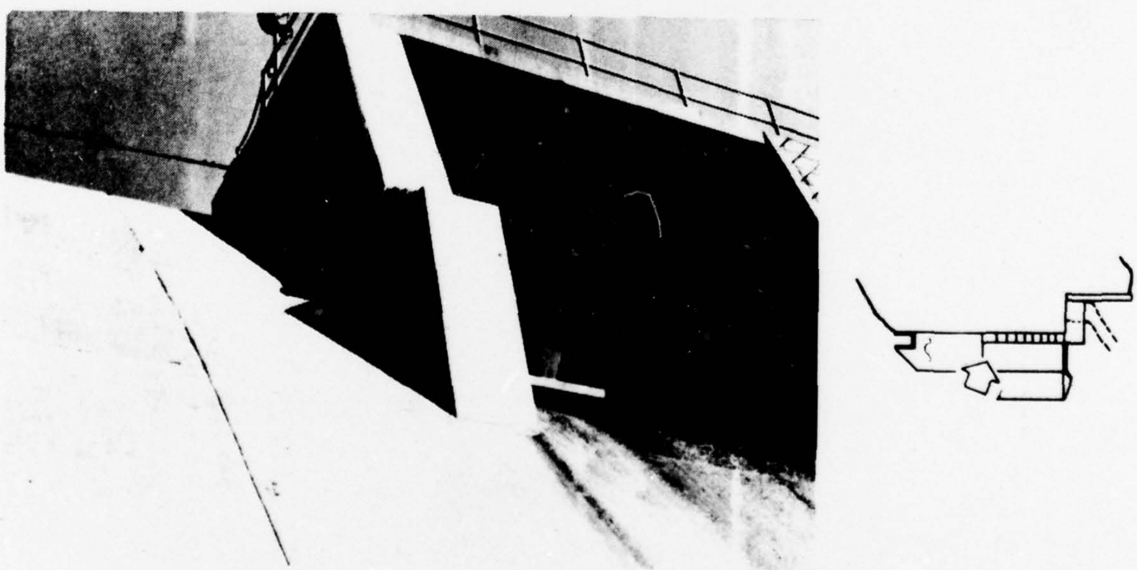
5. Gate house containing sluice gates which control flows into the wood staved pipe to power house.



6. View of downstream face of dam from below dam. Discharge is from leaks along tainter gate contact with sill surface. The spillway surface which was gunited, possibly as much as 30 years ago, is showing significant cracking.



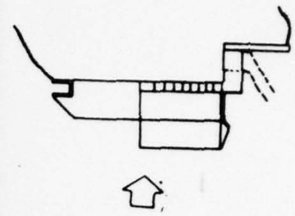
7. Tainter gate control equipment.



8. Closeup of pier section recently replaced.

9. North spillway downstream head wall. Gunite surface is beginning to deteriorate.

10. Base of wall area shown in Picture #9.



11. View of channel immediately downstream of dam.

12. Typical scene along dikes. Large and small trees are located along the entire length of the dikes.

13. Typical scene along reservoir face of dikes.

14. Closeup of growth along dike embankment.

15. Many areas in the downstream area below dikes are not drained. This is a typical picture of that type of condition. No flows were noted in these areas.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM - SALMON RIVER DAM AND DIKES ID# - NY374

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

Authority for this report is provided by the National Dam Inspection Act, Public Law 92-367 of 1972. It has been prepared in accordance with a contract for professional services between Dale Engineering Company and The New York State Department of Environmental Conservation.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Salmon River Dam and Dikes and appurtenant structures, owned by the Niagara Mohawk Power Corporation, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the State of New York.

This Phase I inspection report does not relieve an Owner or Operator of a dam of the legal duties, obligations or liabilities associated with the ownership or operation of the dam. In addition, due to the limited scope of services for these Phase I investigations, the investigators had to rely upon the data furnished to them. Therefore, this investigation is limited to visual inspection, review of data prepared by others, and simplified hydrologic, hydraulic and structural stability evaluations where appropriate. The investigators do not assume responsibility for defects or deficiencies in the dam or in the data provided.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Salmon River Dam is a concrete gravity structure approximately 725 feet long. The dam consists of an ungated spillway section approximately 244 feet long on the north end of the dam and a gated section approximately 256 feet long on the south side of the structure. Short sections of non-overflow structure are found on both the north and south abutment. The dam is approximately 60 feet high with spillway crest at elevation 935. Flashboards on the spillway section raise the normal headwater level to elevation 937. The gated section of the dam consists of 11 tainter gates, each 20 feet wide by 11 feet high. The non-overflow sections of the dam extend into the north and south abutment. The top of the dam at the abutments is at elevation 942, 5 feet above the normal headwater elevation.

A gate house and intake structure, located near the south abutment of the dam, controls flow into a wood stave pipe which feeds the powerhouse located downstream at Bennett's Bridge. The gatehouse contains six sluice gates each 6 feet wide by 16 feet high which discharge into a short section of concrete tunnel. This tunnel then discharges into a wood stave pipe which conducts flow to the power house.

The Salmon River Reservoir is also impounded by three earthen dikes located near the opposite end of the reservoir from the main dam. Dike A is a low dike approximately 5 feet in total height with a top width of 4 feet. This dike restricts flow from the reservoir through a side channel to the Salmon River. The exact location is unknown. Attempts to locate this facility by personnel from Niagara Mohawk Power Company have proven unsuccessful. Dikes B and C prevent flow from the reservoir into other drainage basins. These dikes consist of an earth embankment with a wood sheeting core wall. Side slopes on the downstream side are 1-1/2 horizontal to 1 vertical and on the impoundment side 2 horizontal and 1 vertical. Top width of the dikes are approximately 8 feet. Dike B is approximately 1330 feet long with a maximum height of 13 feet. Dike C is approximately 695 feet long with a maximum height of approximately 10 feet. Both of these dikes are riprapped at the water level.

b. <u>Location</u>

The Salmon River Dam is located in the Town of Orwell, Oswego County, New York.

c. <u>Size Classification</u>

The maximum height of the dam is approximately 60 feet. The storage volume of the dam is approximately 69,000 acre feet. Therefore, the dam is in the Large Size Category as defined by <u>The Recommended Guidelines for Safety Inspection of Dams</u>.

d. <u>Hazard Classification</u>

Numerous small hamlets are located on the Salmon River downstream from the Salmon River Dam. The Salmon River is also used extensively for recreational purposes. Therefore, the dam is in the High Hazard Category as defined by <u>The Recommended Guidelines for Safety Inspection of Dams</u>.

e. <u>Ownership</u>

The dam is owned by the Niagara Mohawk Power Corporation.

f. Purpose of Dam

The dam presently functions as a source of water for power generation by Niagara Mohawk.

g. Design and Construction History

The Salmon River Dam was constructed approximately 1914. Shortly after the completion of the original spillway, the spillway was raised from elevation 924 to its present height. The gated portion of the dam and spillway were covered with a layer of gunite approximately 30 to 40 years ago. This gunite overlay is heavily deteriorated at the present. The ungated spillway was overlain by a layer approximately 18 inches of concrete in approximately 1975. Niagara Mohawk Power Corporation provides constant surveillance of the structure and performs normal maintenance.

h. Normal Operational Procedures

The water level in the impoundment is controlled by Niagara Mohawk in order to provide optimum water for power generation. Tainter gates are operated during periods of high runoff to prevent flow over the ungated spillway section. Stage elevations of the reservoir are telemetered to the powerhouse to provide data for the operating staff. The Niagara Mohawk's staff is reportedly preparing an emergency preparedness and flood warning plan for this dam site.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of Salmon River Dam is 193.4 square miles.

b. Discharge at Dam Site

No discharge records are available for this site. The design flood discharges listed were based on the Snyder Method results.

Computed discharges:

Ungated spillway, top of dam	14,460 cfs
Ungated and gate spillways, top of dikes	42,643 cfs
Ungated and gate spillways, top of dam	62,978 cfs
Ungated spillway, design flood	76,252 cfs (PMF)
	35,448 cfs (1/2 PMF)
Ungated and gated, design flood	87,351 cfs (PMF)
	38,244 cfs (1/2 PMF)

c. Elevation (feet above MSL)

Top of dam	942	
Maximum pool - design discharge (With Gates)	943	(PMF)
	939	(1/2 PMF)
Spillway crest (Without Flashboards)	935	

(With Flashboards) 937
Stream bed at centerline of dam 888 (approx.)

d. Reservoir

Length of normal pool 35,000 feet

e. Storage

Design surcharge 20,000 acre feet

f. Reservoir Area

Spillway pool 2765 acre

g. Dam

Type - Concrete gravity with earthen dikes away from dam along reservoir.
Length - 700 feet.
Height - 60 feet.
Freeboard between normal reservoir and top of dam - 3 feet.
Top width - 8 feet.
Side slopes - Dikes: Upstream - 2:1; downstream - 1-1/2 on 1.
Dams: Upstream - vertical; downstream - 1 on 1.
Zoning - None.
Impervious Core - Wood sheeting.

h. Spillway

Type - Weir and tainter gates.
Length - Weir - 244 feet; tainter gates - 256 feet.
Crest Elevation - Weir - 935 (MSL); tainter gates - 926 (MSL).
Gates - 11 gates each 20 feet wide by 10 feet high.
U/S Channel - None.
D/S Channel - Short concrete apron, natural stream channel.

i. Regulating Outlets

12 foot diameter to 11 foot diameter wood to 11 foot 6 inch diameter steel.

Emergency mud blowout pipes located in south end of dam have reportedly never been used.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The information available for the review of the Salmon River Dam included:

1) Inspection of drilling, grouting and repair Bennett's Bridge Dam by Uhl, Hall and Rich Engineers report on spillway adequacy and

2) Stability analysis for Bennett's Bridge Development by Uhl, Hall and Rich, Engineers July 1973.

3) Drawings entitled "Salmon River Power Development" by Barclay, Parsons and Klapp, Consulting Engineers, dated 1912 through 1916.

4) Drawings on Bennett's Bridge Development by Niagara Mohawk Power Corporation, dated 1971.

5) Hydrographs Project Flood Routing and Individual Discharge Curves, Bennett's Bridge Development, by Uhl, Hall and Rich, Engineers, March 1973.

2.2 CONSTRUCTION

No information available.

2.3 OPERATION

See Section 4.

2.4 EVALUATION

The engineering data reviewed indicates that the dam was carefully designed and constructed. The scope of this report requires no additional research of data at this time. The information available for this report was considered adequate to perform this Phase I investigation.

SECTION 3 - VISUAL INSPECTION

3.1 SUMMARY

a. General

The inspection of the Salmon River Dam was conducted on September 12, 1978. At the time of the inspection water level in the impoundment was at elevation 930, approximately 7 feet below the elevation of the flashboards. Heavy rains the day before had caused the water elevation in the impoundment to rise approximately 5 feet above the previous days elevation. The inspection team was accompanied by a representative of Niagara Mohawk Power Corporation, Mr. Robert Levett. The facility is under continual surveillance by a full time staff which is located at the powerhouse approximately 1-1/4 miles from the dam site.

b. Dam

The dam and spillway system visually conforms to the plans. The ungated spillway section had been recently reconstructed and overlain with concrete and is in excellent condition. The gated spillway section which had been gunite coated approximately 30 to 40 years ago is somewhat deteriorated on the surface. The 11 tainter gates which control the flow through the spillway during periods of high runoff were reputed to be in good operating condition by the owner's representative. The water level in the receiving pool abuts the downstream toe of the gated section of the dam. Therefore, no observation was made regarding seepage at the toe of the dam in this section. The ungated spillway section showed signs of slight seepage along the toe of the dam, however heavy rain periods on the previous day could account for some of this moisture. A floating log barrier is located just upstream from the structure to prevent debris from piling up along the face of the dam and interfering with the operation of the tainter gates. Minor seepage was found on both the north and the south abutments approximately 15 feet above the level of the receiving pool. A gravel outwash on the south abutment indicated substantial flow in this area, however, at the time of the inspection a narrow channel through the gravel outwash, approximately 6 inches wide, showed only minor water flow. This gravel outwash may have occurred from surface runoff. Minor seepage was also evident on the north abutment at an elevation approximately 20 feet above the receiving pool.

c. Non-overflow Structure

The abutments of the dam are composed of non-overflow sections which extend back into original ground. These sections of the dam were found to be in good condition with only minor concrete spalling noted.

d. Appurtenant Structures

Inspections of Dikes B and C were also conducted. These dikes are located deep in wooded areas and the service roads have not been maintained for routine inspection. At the time of inspection, the reservoir level was at elevation 930 with almost no head on the dikes. The photographs in the report show that these dikes are heavily overgrown with trees and brush and the downstream toe of both dikes are extremely wet. Topographic maps of the area indicate that these areas were swamps. The heavy rainfall of the night before would have contributed to the wetness in this area. These site conditions made it impossible to determine by visual inspection whether the moisture was caused by surface water or by seepage through the embankment.

The gatehouse at the north abutment is severely deteriorated. The building is a wood frame structure which houses the control mechanism for the gates which control flow into the power plant. Wooden timbers have been used to brace the roof in many locations. The owner's representative indicated that budget requests had been made for reconstruction of the gate house.

e. Reservoir Area

The reservoir area is generally heavily forested. There is no evidence of the deposition of sediment in the reservoir.

f. Downstream Channel

The downstream channel was found to be in good condition founded in bedrock.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Operational procedures for the dam were not observed by this inspection team. The owner's representative indicates that flow levels in the reservoir are monitored at the power house. Water level in the reservoir is maintained to provide optimum levels for power generation. During periods of high runoff tainter gates are operated to allow outflow from the reservoir to avoid topping of the flashboards on the ungated sections of the spillway. Niagara Mohawk Power Corporation provides full time surveillance of the site and a full time staff is available for operation.

4.2 MAINTENANCE OF THE DAM

The dam is maintained by Niagara Mohawk Power Corporation with a full time maintenance staff located at the Benett's Bridge Power Station which is 1-1/4 miles downstream. When weather permits, the dam site is visited everyday. Telemetry equipment at the dam site provides the staff at the power house with a continuous readout of the reservoir stage. Reportedly, the dam is tentatively scheduled for repair and modification work in 1980. This work would include raising the dikes to elevation 946, replacement of the wood staved water supply conduit which goes from the dam to the power house, and some selected repair of spalling gunite areas on the gated spillway area.

SECTION 5 - HYDROLOGY AND HYDRAULICS

5.1 EVALUATION OF FEATURES

The Salmon River Dam, which is a hydro power impoundment facility, lies at the western end of the Salmon Reservoir. The drainage area of the dam is 193.4 square miles as planimetered from U.S.G.S. quad sheets, the lake is 6.6 miles long with a surface area of 4.3 square miles. The volume of the impoundment is purely a function of the natural watershed. For the dam's location, no historical information was available on the occurrence of flood events. Also, no information relevant to the design of the dam was available for this investigation. Therefore, this analysis is based on information obtained from the field inspection, the plans included herein, U.S.G.S. quadrangle mapping and other sources of information and references listed in Appendix E. The hydrologic and hydraulic analysis is provided in Appendix C.

The purpose of this investigation is to evaluate the dam and spillway with respect to their flood control potential and adequacy. This has been assessed through the evaluation of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the flood through the reservoir and the dam's spillway system. The PMF event is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration loss and concentration runoff of a specific location that is considered reasonably possible for a particular drainage area. Since this dam is in the Large Category and is a High Hazard, the guidelines criteria (Ref. 1) require that the dam be capable of passing the Probable Maximum Flood.

The hydrologic analysis was performed using the unit hydrograph method to develop the flood hydrograph. Due to the limited scope of this Phase I investigation, certain assumptions, based on experience, were used in this analysis and in the determination of the dam's spillway capacity to pass the PMF. This was done with the concept that, if the dam was unable to satisfy this criteria, further refined hydrologic investigations would be required. In preparing the unit hydrograph, both Clark and Snyder coefficients were estimated. For the Clark Method, values of Tc = 13.70 and R = 13.70 were computed. The values of R/(Tc + R) was estimated at 0.50 for the analysis. For the Snyder Method, values of Tp = 11.2 and Cp = 0.625 were computed. The two unit hydrographs were developed from these parameters as well as two sets of PMF hydrographs. The resulting two PMF hydrographs developed from the two methods were then compared and evaluated. The PMF hydrograph was determined using the Probable Maximum Precipitation rainfall data obtained in Hydrometeorological Report No. 33. An index rainfall of 19.2 inches for 200 square miles for a period of 24 hours was used in the analysis. Base flow for the basin was assumed to be 2 cubic feet per second per square mile, while loss rates were set at 1.0 inches initial abstraction and 0.1 inches/hour continuous loss rate. The loss rate functions for the basin yielded 14.49

inches of runoff from 17.89 inches of precipitation. The flood surcharge storage effect from the reservoir was assumed to vary linearily with the spillway elevation surface area (the lake's spillway elevation surface area times the surcharge depth yields storage - See Sheet C-4). In Case I, only the service spillway was evaluated to pass the PMF hydrograph. The tainter gates were assumed to be either closed or not accessible to operate. Since there are dam keepers at the Bennett's Bridge Power house nearby and they are on duty on a full-time basis and can monitor stage in the reservoir, additional analyses were made with the tainter gates in operation. These analysis were performed in Case II. The Case II analysis was cursory, under this Phase I investigation. In Case I, the spillway capacity (up to the top of the dam elevation) considering the service spillway only is estimated at 14,463 cfs. This was based on an effective spillway length of 244 feet with a discharge coefficient of 3.2. The top of dam section was assumed to elevation 942. The elevation of the reservoir was assumed to be at the spillway crest, elevation 935, at the initiation of the flood event. In Case II, the tainter gates were assumed opened. The staging of the opening of the gates was not considered. In the first run the gates were assumed opened under full head. In the second run it was assumed that the reservoir was down when the gates were opened, requiring the reservoir to rise in order to obtain peak discharge capacity. Reportedly, the owner intends to raise the dikes in 1980. These dikes are located along the reservoir away from the location of the dam. Case I did not consider the dikes as an outflow possibility in the discharge-storage relationship. In Case II, overtopping of the dikes was considered in the reservoirs stage-discharge relationship. In Case II, the spillway and tainter gate capacity to the top of dike elevation is 42,643 cfs, while to the top of dam is 62,978 with overtopping of the dikes. With the dikes raised, the spillway capacity would be 52,372 cfs to the top of dam.

The U. S. Army Corps of Engineers, Hydrologic Engineering Center's Computer Program HEC-1 using the Modified Puls Method for flood routing was used to evaluate the dam and spillway capacity. The results of this analysis are shown below:

HEC-1 PMF ANALYSIS

CASE I - SERVICE SPILLWAY ONLY, TAINTER GATES CLOSED
RESERVOIR LEVEL 935 AT INITIATION OF FLOOD

Percent Of PMF	CLARK'S METHOD Run-off Discharge (CFS)	CLARK'S METHOD Routed Discharge (CFS)	SNYDER'S METHOD Run-off Discharge (CFS)	SNYDER'S METHOD Routed Discharge (CFS)
10	7795	5651	9498	7116
20	15590	14444	18996	17468
30	23385	22192	28494	26835
40	31179	28829	37993	35972
50	38974	35682	47491	25448
60	46769	36143	56989	37078
70	54564	37555	66487	46916
80	62359	45890	75985	56663
100	77948	62134	94981	76252

HEC-1 PMF ANALYSIS

CASE II WITH TAINTER GATES OPEN

Percent Of PMF	SNYDER'S METHOD WITH RESERVOIR HIGH WHEN OPENED Run-off Discharge (CFS)	SNYDER'S METHOD WITH RESERVOIR HIGH WHEN OPENED Routed Discharge (CFS)	CLARK'S METHOD WITH RESERVOIR LOW WHEN OPENED Run-off Discharge (CFS)	CLARK'S METHOD WITH RESERVOIR LOW WHEN OPENED Routed Discharge (CFS)
10	9498	9239	7795	6877
20	18996	18478	15590	13794
30	28494	25369	23305	20692
40	37993	31487	31179	20362
50	47471	38344	38974	32020
60	56989	47436	46769	37853
70	66487	56059	54564	45806
80	75985	65612	62539	53207
100	94981	87351	77940	69659

In Case I, a 20 percent reduction due to the reservoir effect occurred, while for Case II, a 8 - 10 percent reduction in the peak flow was estimated. In Case II, runs were made to determine the sensitivity of the results using different methods while attempting to minimize the number of analyses. Based on the above results, the spillway is capable of passing only 20 percent of the PMF with the gates closed. In Case I, the safe discharge capability, without topping the dam or dikes, would be an even lower amount since the top of the dam is 942 and the top of the dikes is currently 940 elevation. With the gates open, the spillway capacity would be in the range of 70 to 80 percent of the PMF with the dikes raised. In the latter case, since the dikes are topped prior to the dam being overtopped, only 60-70 percent of the PMF can be safely discharged. The variations in the spillway capacity ranges relate mostly to the method of computation, Snyder versus Clark. Since these capacities are greater than 50% of the PMF with the gates in operation, then according to the Corps of Engineers screening criteria, the spillway has been found to be inadequate but <u>not</u> seriously inadequate. This analysis indicates the dam would be overtopped by approximately 1 to 5 feet with the PMF depending on whether the dikes are raised.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations And Data Review

The concrete dam retains stability at this time with no indication of misalignment, settlement or other significant structural movement. The northerly section of the dam (ungated spillway segment) has been recently repaired (new concrete surfacing, rebuilding of headwall between ungated and gated sections), and the exposed concrete is in good condition. Conversely, surface concrete in the gated southerly section of dam (11 tainter gates) is significantly spalled and deteriorated at numerous locations (deterioration has penetrated several inches, exposing wire mesh reinforcing, etc.).

Indication of a surface flow of water exists in the ground area immediately adjacent to both the southerly abutment and northerly abutment. This flow is evident of surface water from the higher elevation adjacent to the dam but could be dam seepage; the quantities involved appear to have been very limited and past effects on the dam structure have been minimal. The stilling basin below the downstream toe of the dam shows ponded water from spillway gate leakage and rain, a condition which interferes with attempts to determine underdam seepage.

Inspected earth dikes constructed up river from the dam to help form the present impounding area are generally in stable condition, but the surfaces are heavily overgrown with brush and trees, particularly the top and downstream slope; riprap, judged to generally be in fair condition, exists on the impounding slopes but growth is occurring through the material at various locations.

b. Geology and Seismic Stability

The area is underlain by the Oswego Formation of Late Ordovician age. Rocks of this unit are primarily quartzitic and vary from siltstone to fine-grained sandstone. Depending upon grain size, bedding thickness varies from laminae (less than 1 cm.) to medium-bedded (about 20 cm.).

Although the rock does contain some clay matrix, rock fragments, and calcite cement, they are of relatively minor amounts and thus, because of its quartz-rich composition, these rocks would be considered as being relatively insoluble.

Bedding in this area shows a very gentle dip to the west, less than 1 degree. The rock is well-jointed. No indication of faulting was seen. Neither the New York Sate Geologic Map (1971) nor the Preliminary Brittle Structures Map (1977) indicate the presence of any faults in the general area.

The greatest earthquake recorded in this general region occurred in 1853 and measured VI on the Modified Mercalli Scale. It was centered about 24 miles northeast of the dam. A number of smaller earthquakes have been recorded more recently to the north, east, and south; none are on record as occurring since 1963, register no more than intensity III and are all more than 30 miles distant. Although the Seismic Probability Map designates the area as being in Zone 2, it would be more realistic to downgrade the area to a Zone 1.

According to the 1912 bid to construct, the bedrock surface was to be roughed and cleaned with grouting required as necessary. The 1914 application indicates that the concrete was to be carried down into a trench in the rock foundation for cutoff. Assuming these intentions were carried out properly, a good contact with the bedrock exists.

Wetness seen at the junction of the abutment to the embankment may possibly indicate seepage along joint and bedding planes where grout is lacking.

c. Data Review and Stability Evaluation

Design drawings applicable to the original construction of the dam and impounding dikes, dated 1913 and 1914, are available on drawings prepared by Niagara Mohawk Power Corporation dated 1971. The results of an engineering study to evaluate the physical condition of the dam and impounding dikes, prepared for Niagara Mohawk and dated 1973, is also available. Copies of these materials are included in Appendix B. Information applicable to the dam includes elevations and cross-section; these data indicate the dam structure bears directly on rock. The 1914 drawings indicate the dam's spillway section was raised by eleven feet shorty after the completion of the original structure.

The drawings (and field observations) indicate the dikes (referred to as Dikes "B" and "C") are constructed with an upstream slope of 2 to 1 (H to V) and a downstream slope of 1-1/2 to 1 (H to V). Most, but not all, embankment placed to obtain the dikes is provided with a wooden sheet pile cutoff. Typically, the embankment sections are not high, 12 feet (approximately) representing the greatest dike height.

The 1973 engineering report (Appendix B) includes the results of stability analysis to evaluate various dam and dike sections subject to forces expected to occur during the facilities service life. Analysis for the concrete dam sections considered the effects of a reservoir level at an elevation corresponding to the top of spillway flashboards with ice acting, and hydrostatic uplift acting across 100 percent of the dam base area. The method of analysis discussed in the 1973 report is in general accordance with currently recommended procedures. One of the cases for stability conditions analyzed in the 1973 report has been checked independently (overturning, impounded water at flashboard elevation, ice and uplift acting, see Appendix

D), and the resulting safety factor found to be in general agreement with the 1973 value. These stability analyses indicates the structure retains stability against overturning and sliding for the conditions assumed, i.e., reservoir level at flashboard elevation, ice, uplift, and seismic forces acting.

It was noted that the factor of safety against sliding in the 1973 study was computed utilizing the shear-friction method, a method which considers both a coefficient of friction and a shearing (or bond) resistance as acting at the base of the dam to oppose motion. A value of 190 psi was used as a safe working shear stress for concrete; it is felt such a value is reasonable/conservative. For this report, properties of the concrete in the dam and the site's rock have not been determined.

The numerical analysis is based upon having an integral structural section in good condition. At present, the gated section of dam has suffered surface deterioration of the concrete. To prevent further deterioration and the possible development of seepage cracks, factors which could effect stability, a program to repair/rehabilitate the deteriorated areas of the dam should be planned.

The earth dikes are generally in stable condition although heavily overgrown with brush and trees. It is understood that a planned 1980 improvement for this facility will have the earth dikes (Dikes "B" and "C") raised approximately six feet and widened, to enable the impounding area to adequately protect against certain flood conditions. Because of the potential for damage to earth structures caused by trees being uprooted in high wind storms, it is recommended that the clearing and grubbing necessary for increasing the dike sections be accomplished as soon as is practical, and before the 1980 construction period. Where large trees may be involved in the removal effort, it is recommended that the trees be cut but the tree stumps be left in place during the interim period. For a longer period, seepage paths may develop along the root systems, therefore, earthwork performed on the dikes should include proper removal of the trunks and root systems.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

The following assessments are based on the Phase I visual examination and analysis of hydrology and hydraulics and anaylsis of structural stability:

1) The dam visually conforms to the details provided on the construction drawings. There are no signs of deformation or structural distress to the dam.

2) Minor seepage exists at both the north and the south abutment at an elevation approxiamtley 15 to 20 feet above the receiving pool.

3) The mechanical equipment at the dam is in good working condition, however, the structure enclosing the sluice gate operators which control flow into the intake tunnel is badly deteriorated.

4) The dikes which are located on the southwest bank of the reservoir are heavily overgrown with trees and brush. These dikes are inaccessible and no regular program of inspection has been adopted by the owner.

5) The elevation of these dikes is two feet lower than the top of the dam.

6) One of the dikes, Dike A, has not been recently located by the owner.

7) The hydrology and hydraulic analysis indicates that the spillway is capable of passing 60 to 70 percent of the Probable Maximum Flood (PMF).

8) The stability analysis indicates the gravity dam structure retains stability against overturning and sliding for the conditions assumed.

7.2 REMEDIAL MEASURES

Based on the above assessments of the dam, the following remedial measures are recommended:

1) Seepage at the abutments should be investigated and/or monitored to determine the extent of the seepage. Special attention should be given to the south abutment where a gravel out-wash has occurred. Remedial action should be taken as required.

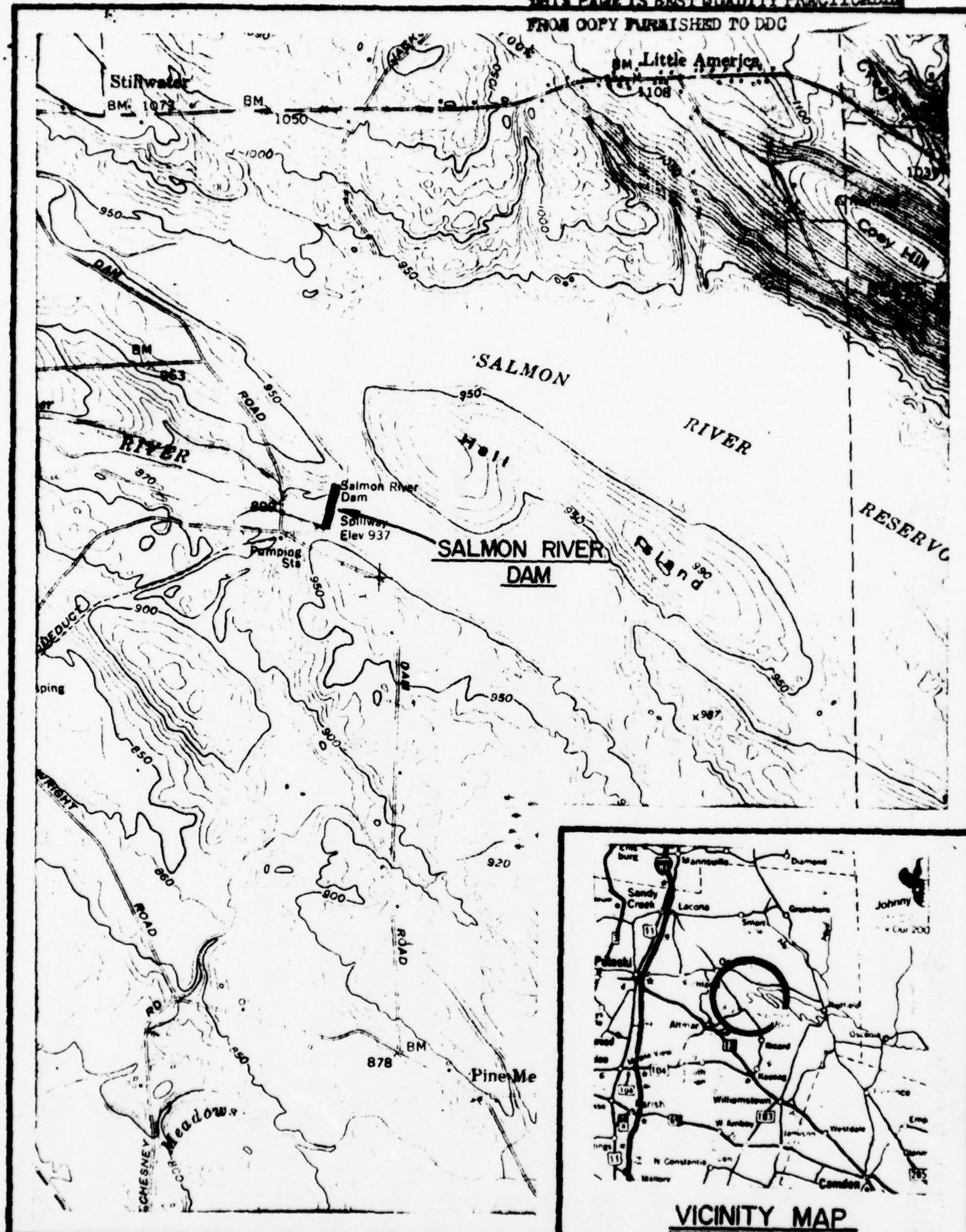
2) The building enclosing the sluice gate mechanisms which control flow to the intake tunnel should be replaced.

3) Dikes B and C should be cleared of heavy overgrowth of brush and trees. Stumps should be allowed to remain in place until dike elevation is raised. Access should be provided to these dikes and a regular program of inspection should be adopted by the owner.

4) Dike A should be located and its function should be fully assesed by the owner.

5) Since the spillway is capable of passing only 60 to 70 percent of the Probable Maximum Flood (PMF), further hydraulic and hydrologic investigations should be made to refine the computations provided in this Phase I investigation. Based upon these findings, adequate spillway capacity should be provided to allow passage of the PMF. The function of Dike A should be fully assessed as to its ability to accommodate the flows from peak runoff situations.

6) Dikes B and C should be raised to elevation 846 to assure containment of the PMF.



LOCATION PLAN

FIGURE 1

Note: all Figs. are best available to DDC.

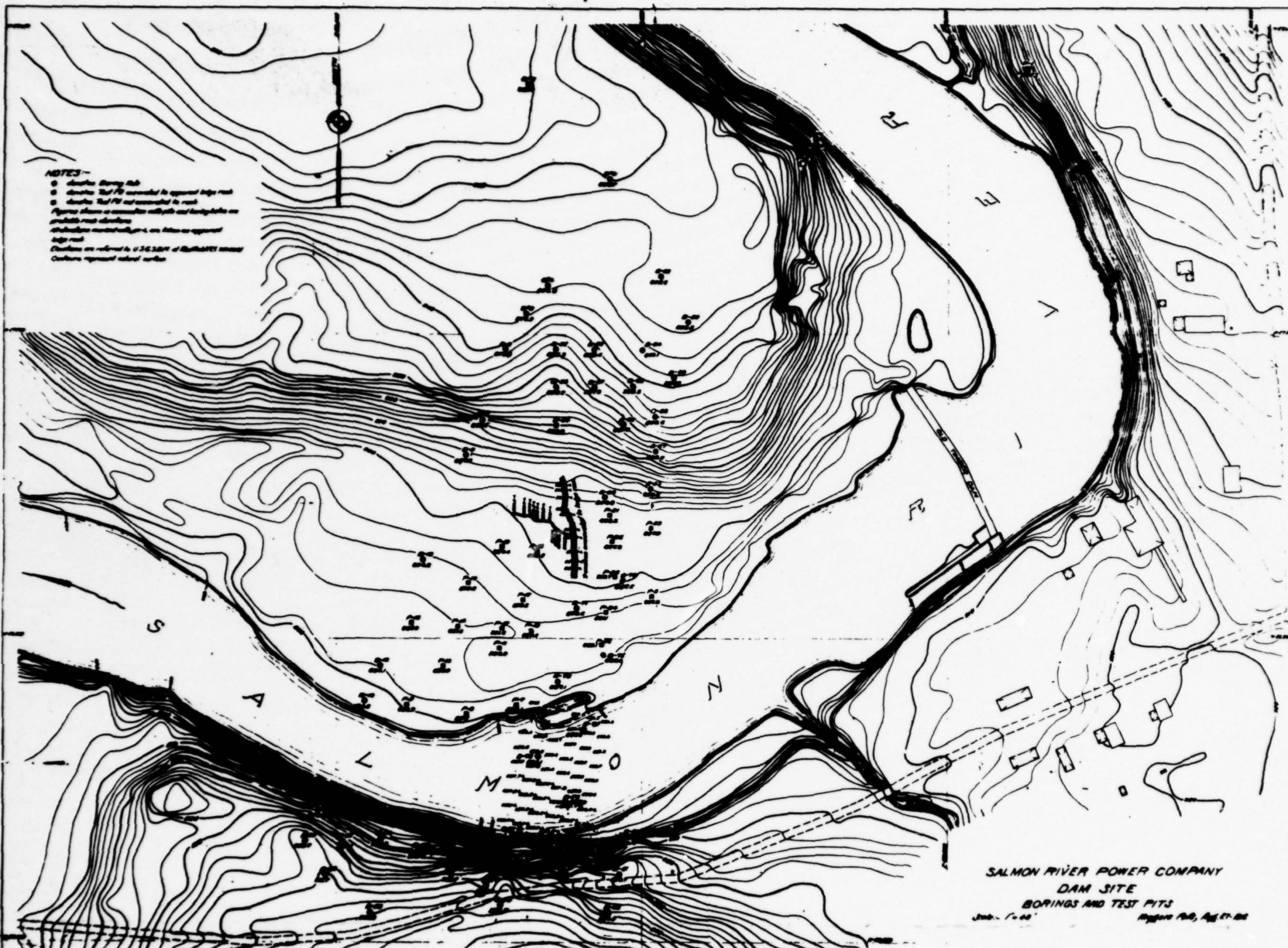

NOTES:-
SALMON RIVER POWER COMPANY
DAM SITE
BORINGS AND TEST PITS
M-C-102

FIGURE 2

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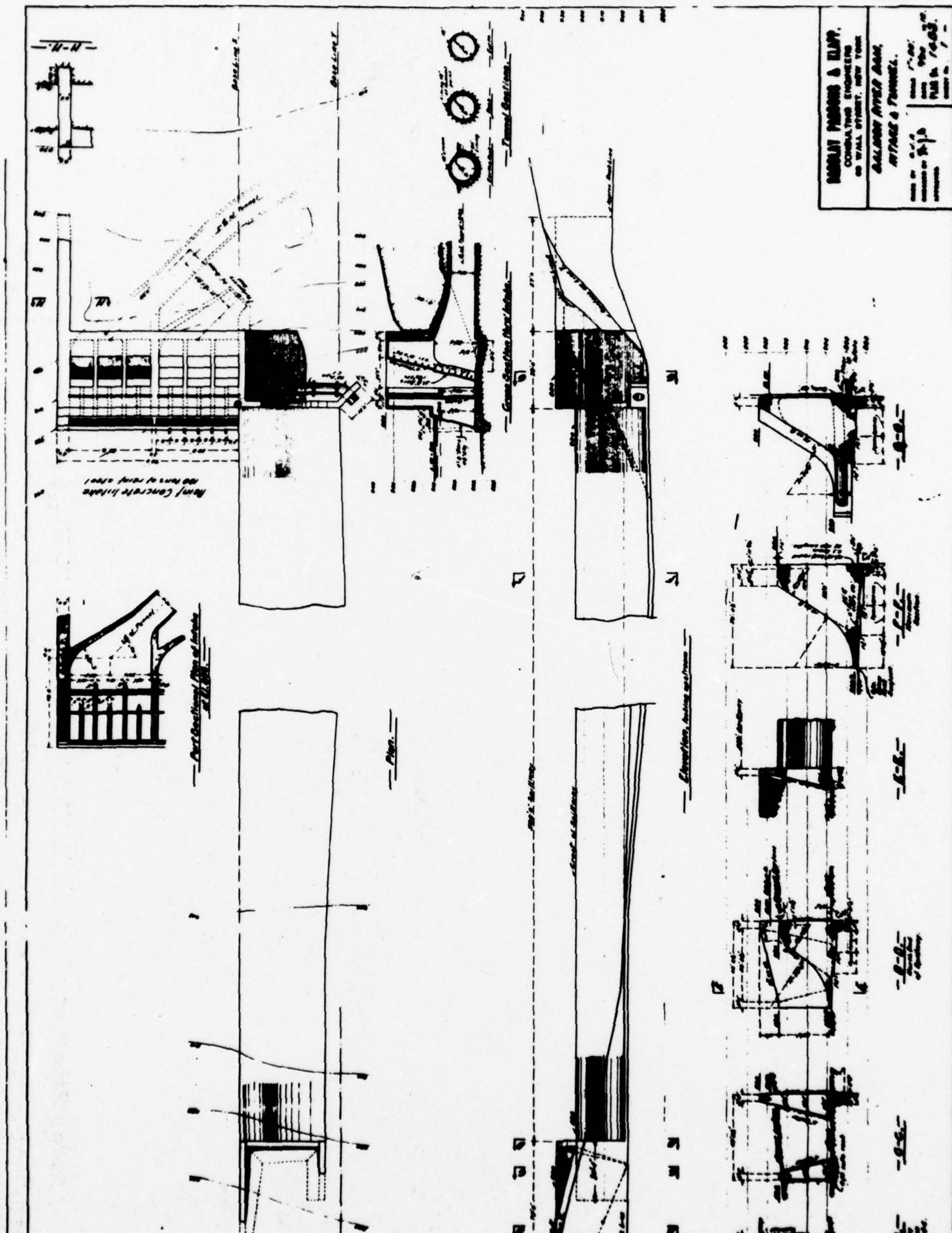

FIGURE 3

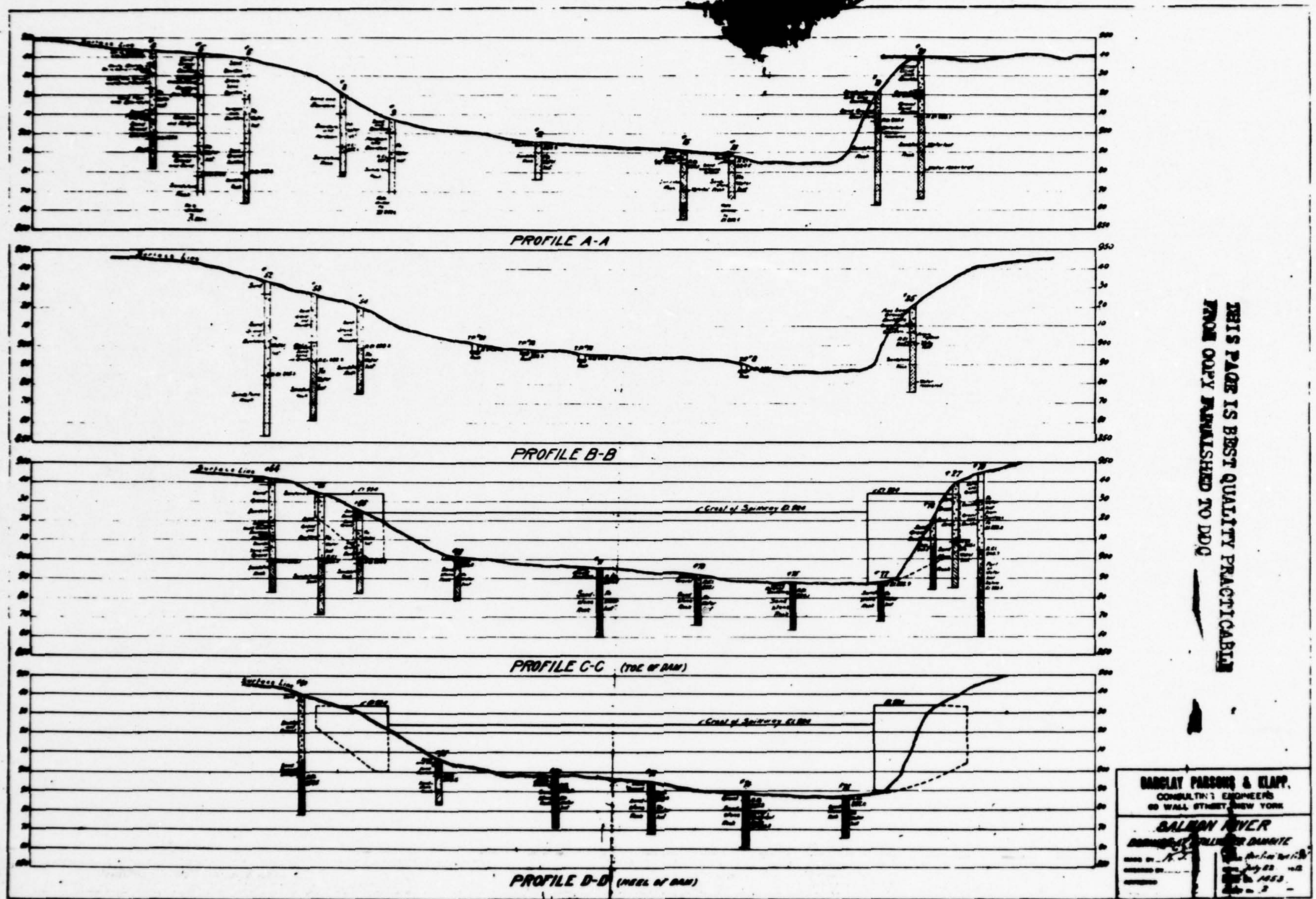
PROFILE A-A
PROFILE B-B
PROFILE C-C (TOE OF DAM)
PROFILE D-D (HEEL OF DAM)
Surface Line
Crest of Spillway El. 900
BARCLAY PARSONS & KLAPP,
CONSULTING ENGINEERS
60 WALL STREET, NEW YORK
BALSAN RIVER

FIGURE 4

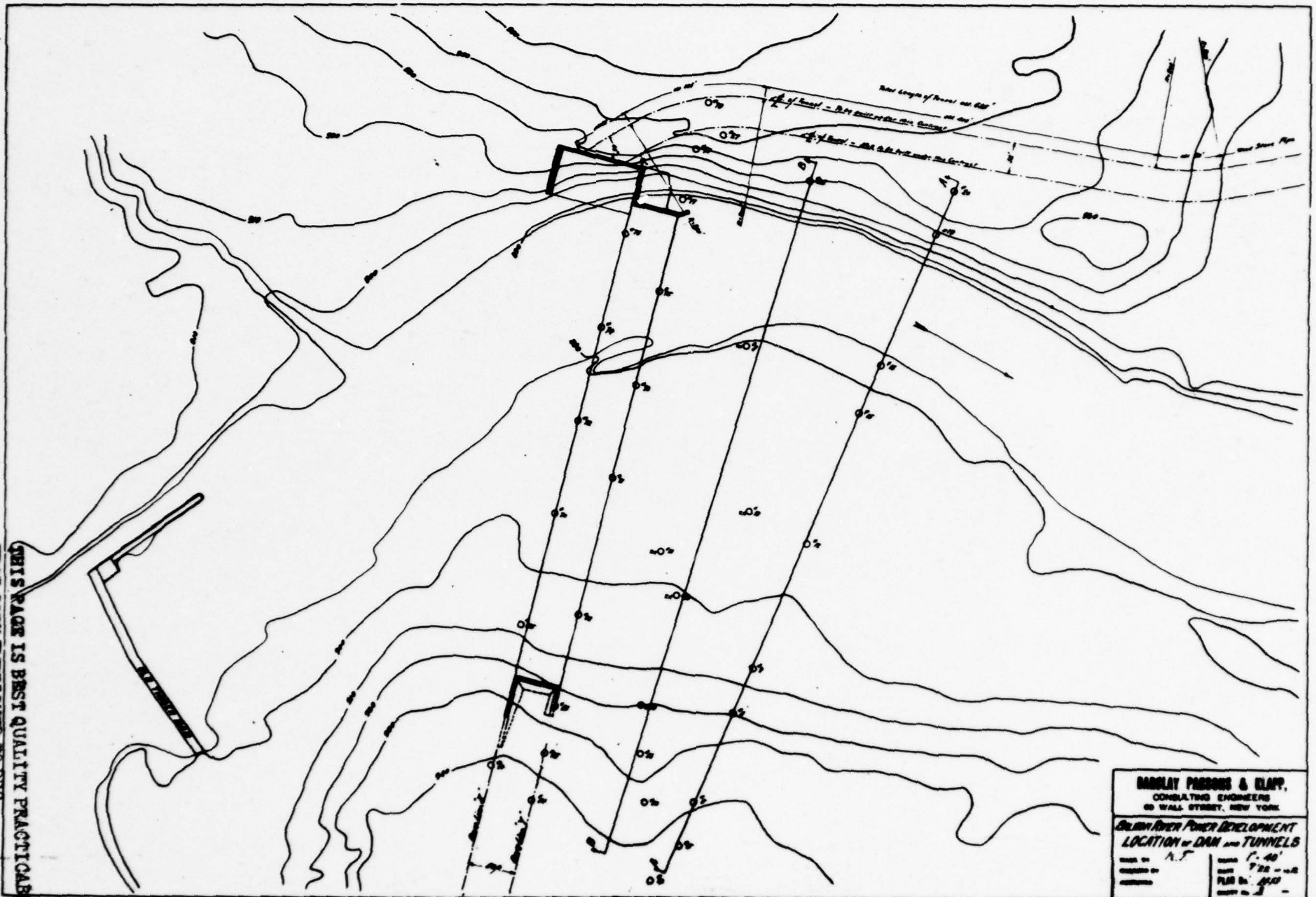
CONSULTING ENGINEERS
POWER DEVELOPMENT
LOCATION OF DAM AND TUNNELS
1" = 40'

FIGURE 5

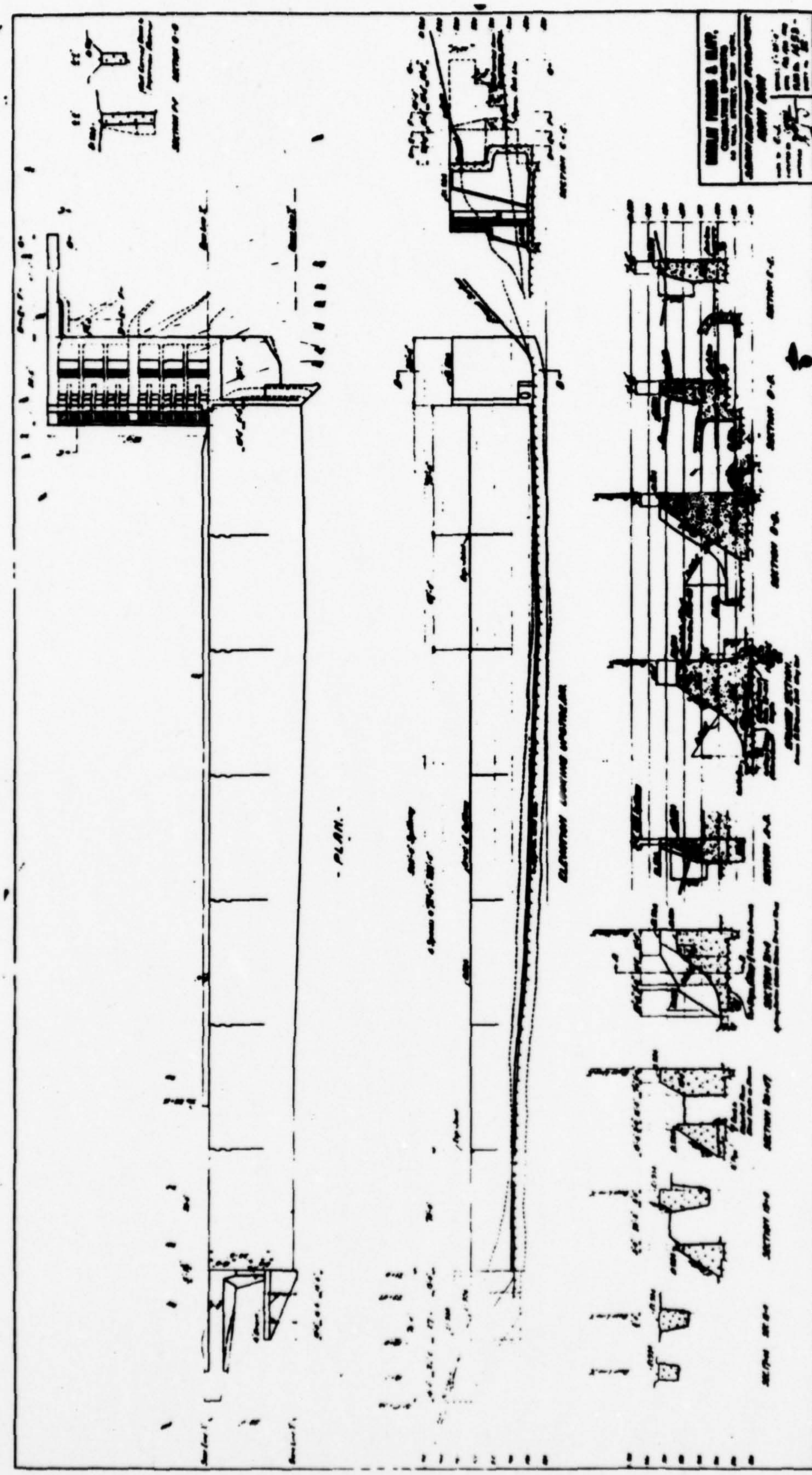

FIGURE 6

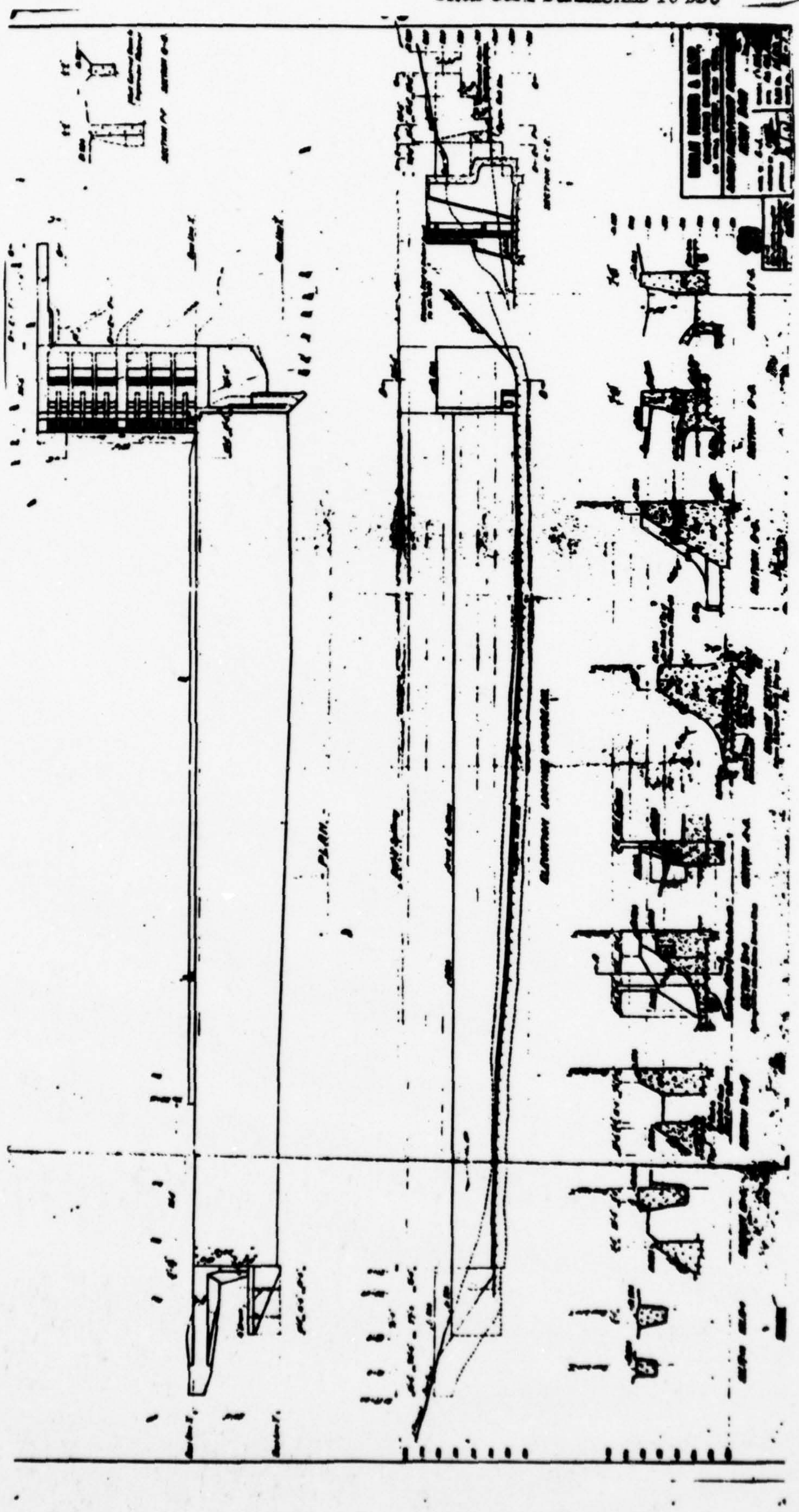

FIGURE 7

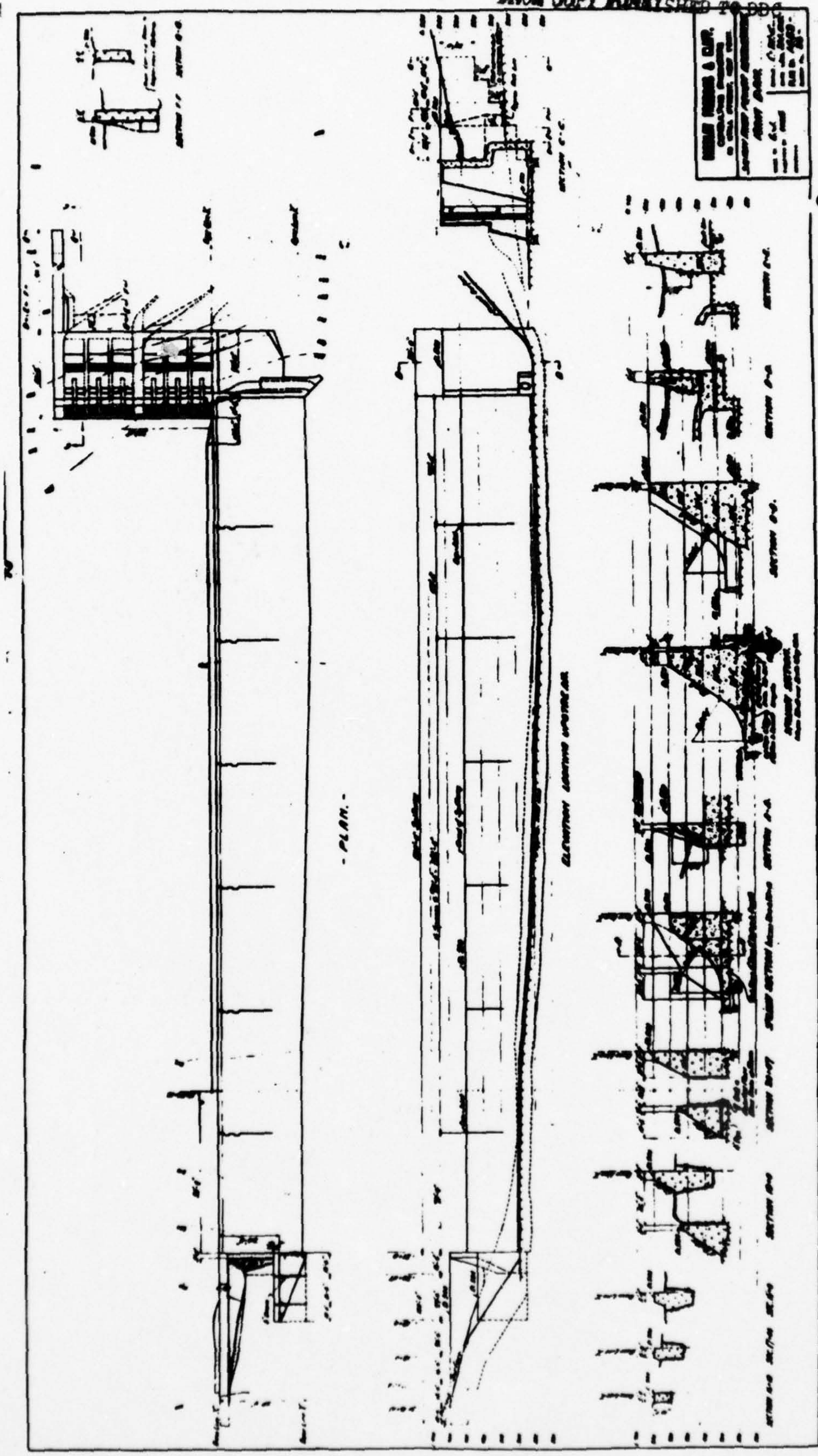

FIGURE 8

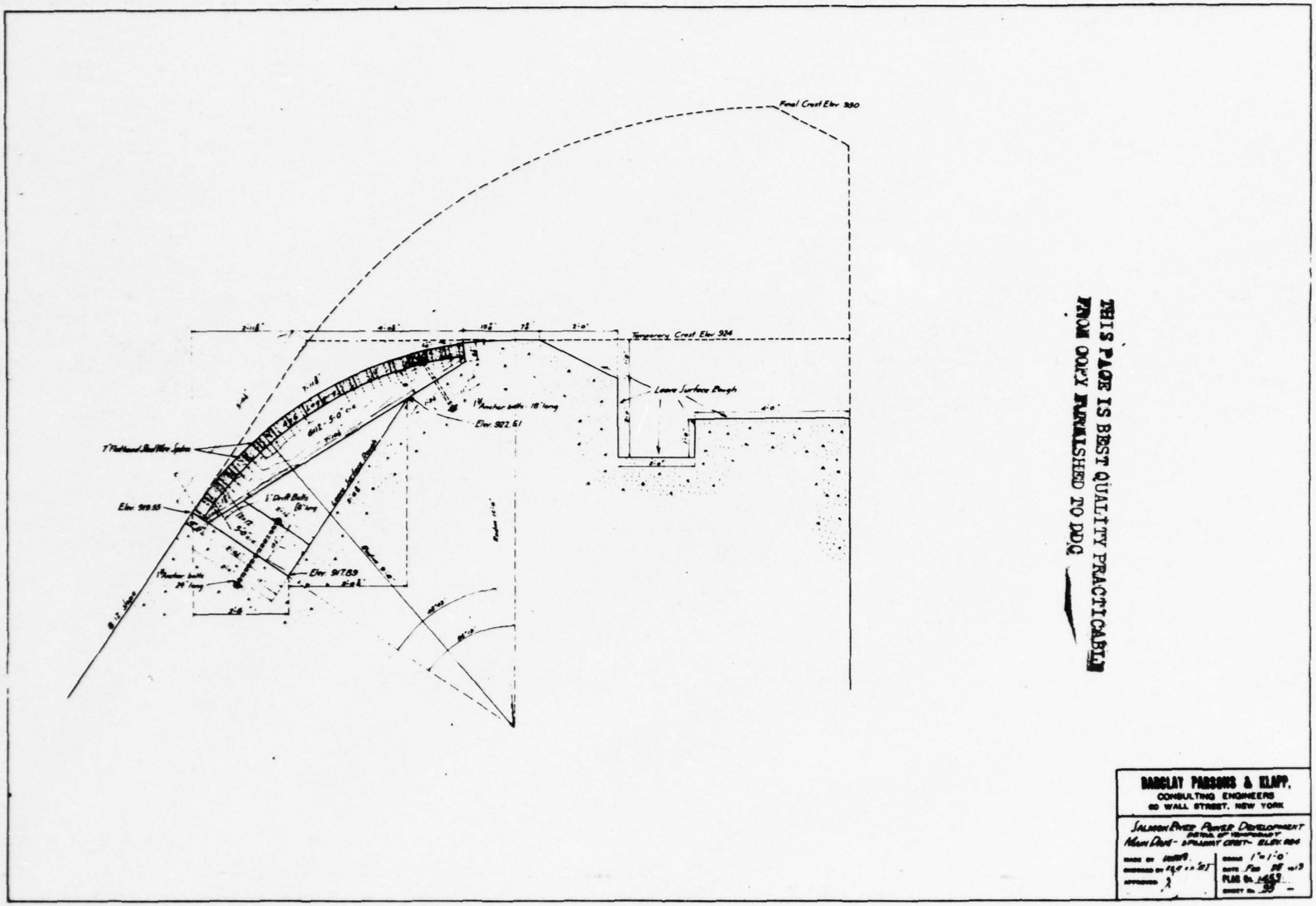
Final Crest Elev 930
Temporary Crest Elev 924
Leave Surface Rough
Elev 922.51
Elev 919.55
Elev 917.89
BARCLAY PARSONS & KLAPP,
CONSULTING ENGINEERS
60 WALL STREET, NEW YORK
SALMON RIVER POWER DEVELOPMENT
DETAIL OF TEMPORARY
MAIN DAM - SPILLWAY CREST - ELEV. 924
SCALE 1"=1'-0"

FIGURE 9

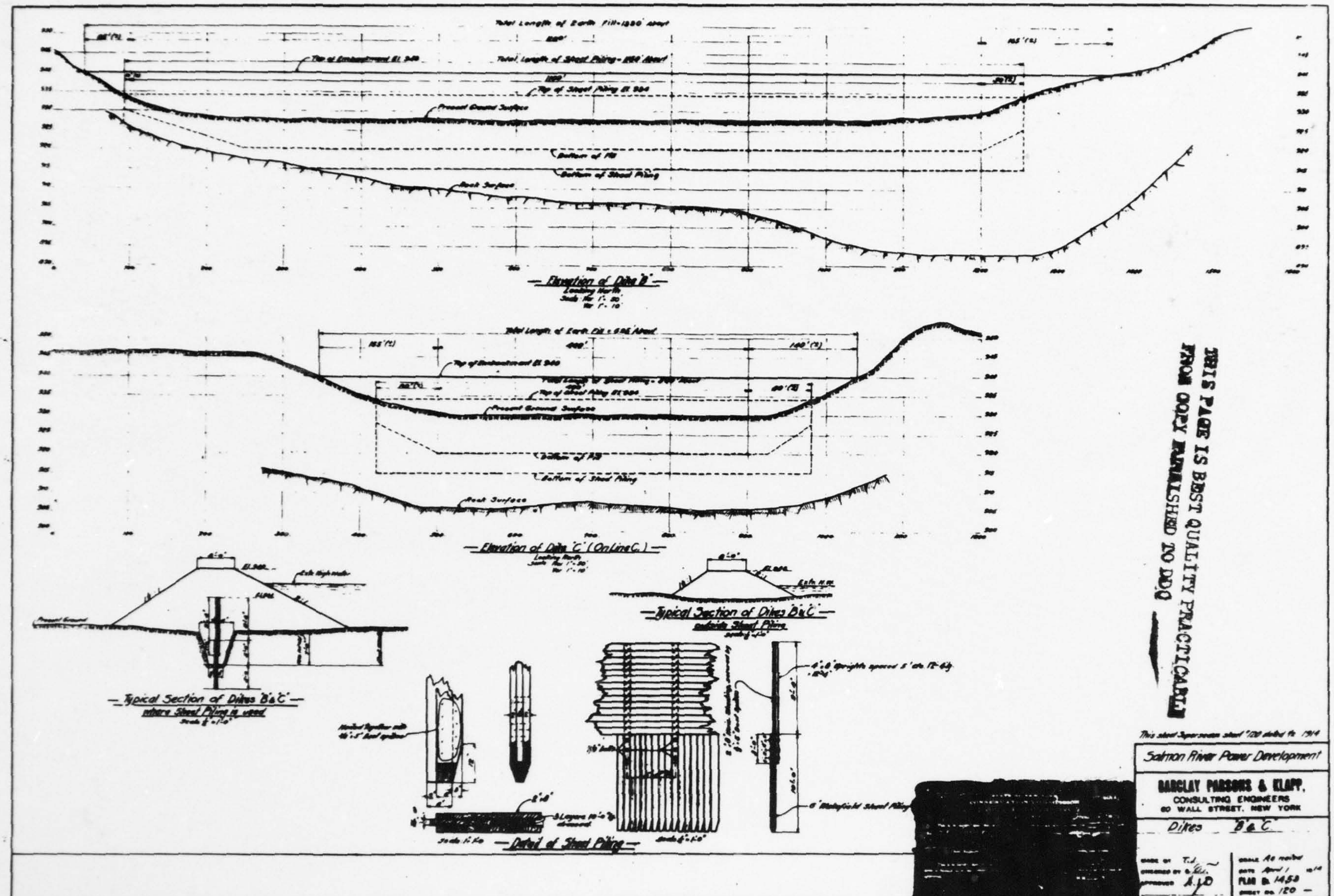
Elevation of Dike 'B'
Elevation of Dike 'C' (On Line C.)
Typical Section of Dikes 'B' & 'C' where Sheet Piling is used
Typical Section of Dikes 'B' & 'C' outside Sheet Piling
Detail of Sheet Piling
Salmon River Power Development
BARCLAY PARSONS & KLAPP,
CONSULTING ENGINEERS
60 WALL STREET, NEW YORK
Dikes 'B' & 'C'
[redacted]

FIGURE 10

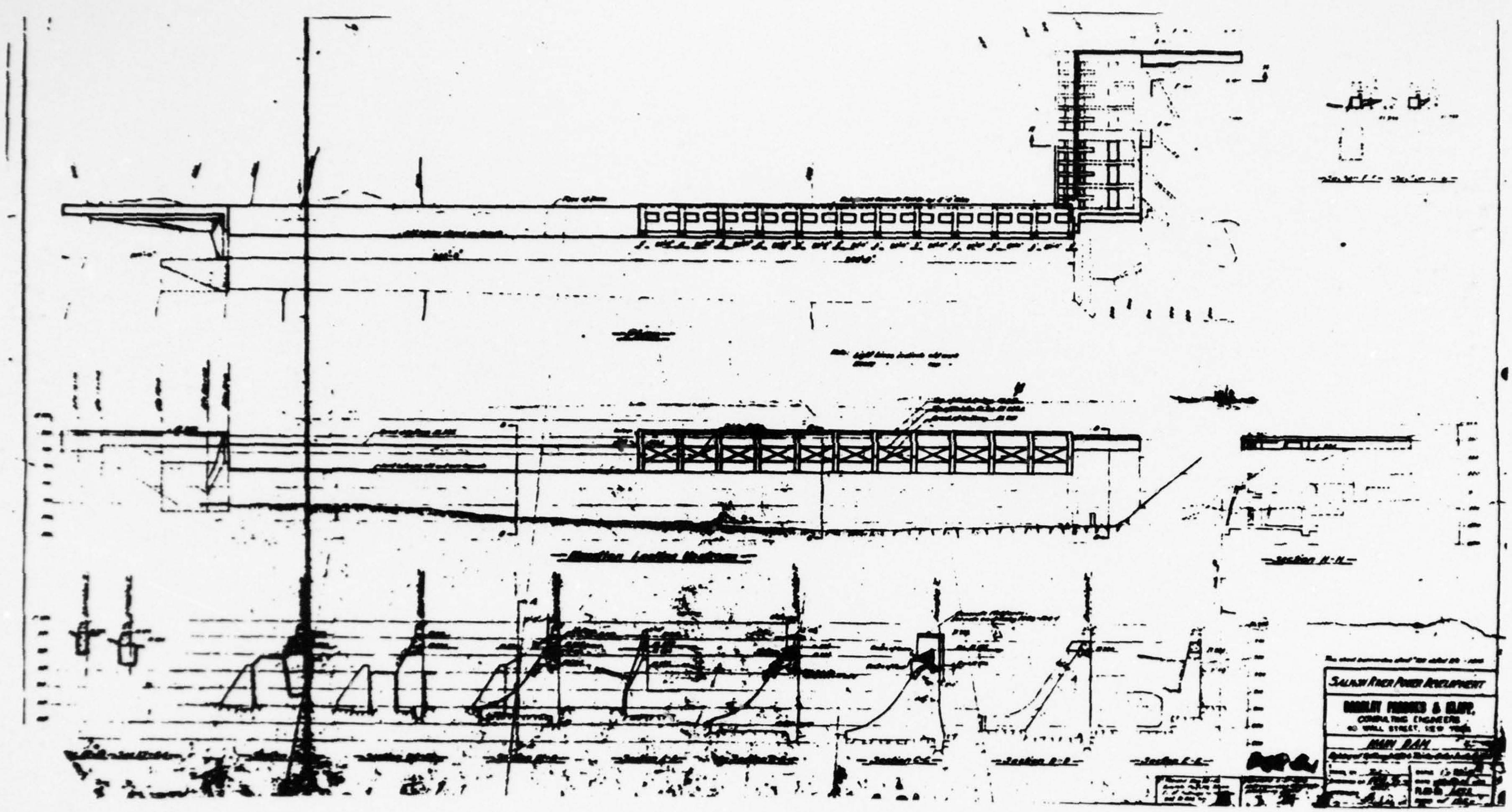
Section H-H
Section B-B
Section E-E
Section C-C
SALMON RIVER POWER DEVELOPMENT
CONSULTING ENGINEERS
40 WALL STREET, NEW YORK
MAIN DAM

FIGURE 11

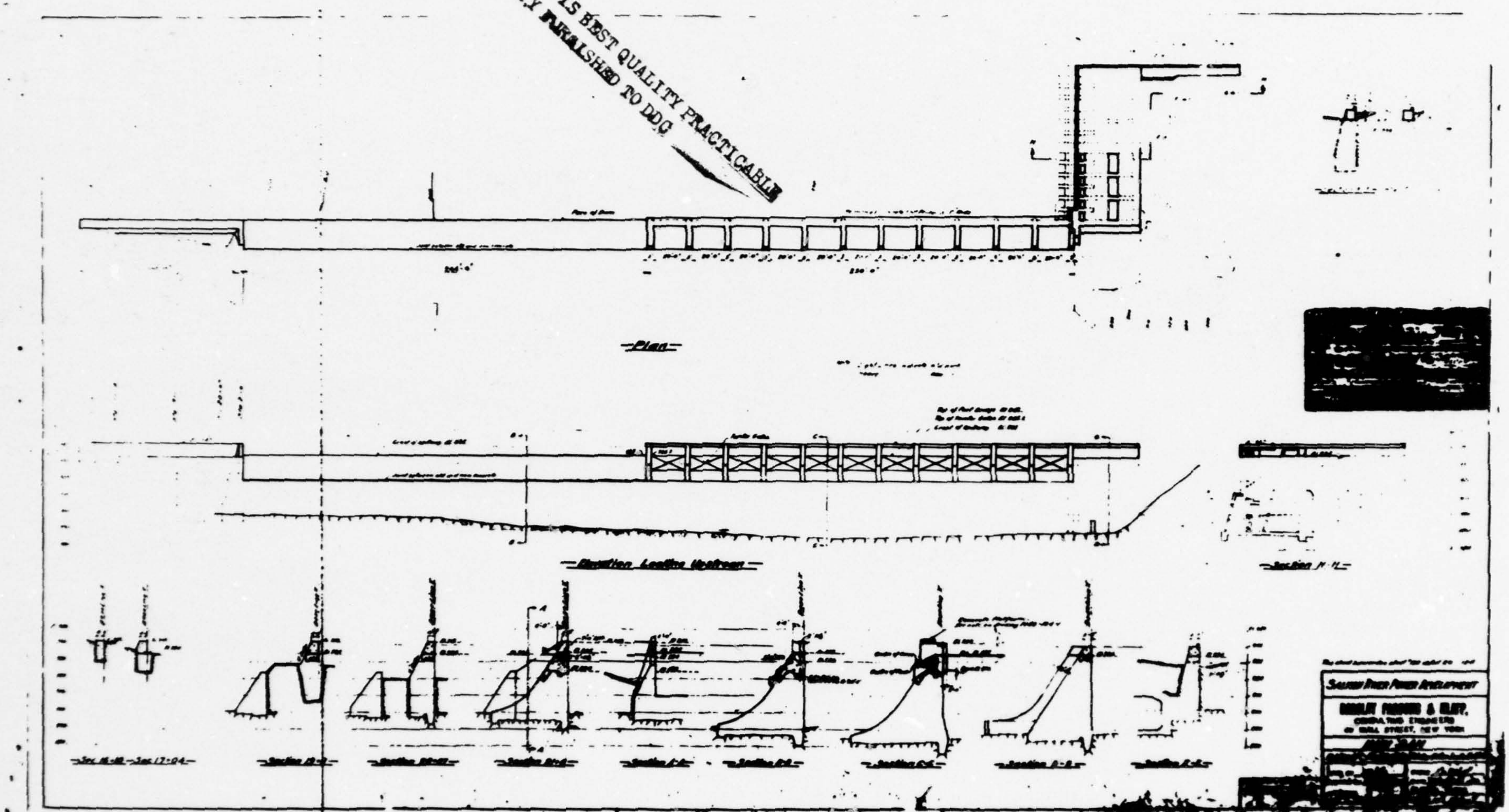

FIGURE 12

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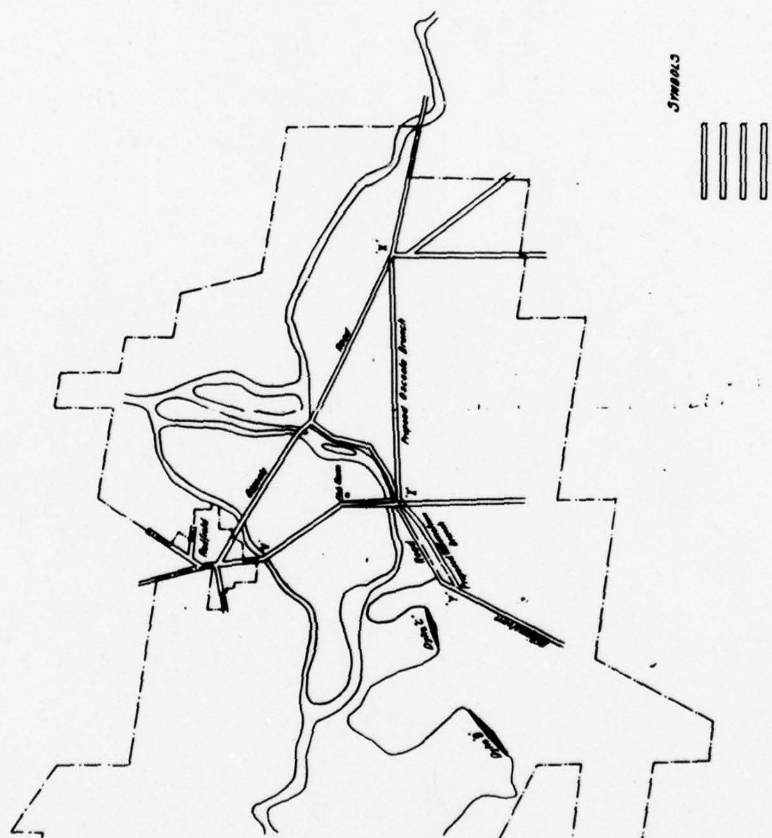

Salmon River Power Development

BARCLAY PARSONS & KLAPP,
CONSULTING ENGINEERS
60 WALL STREET, NEW YORK

FIGURE 13

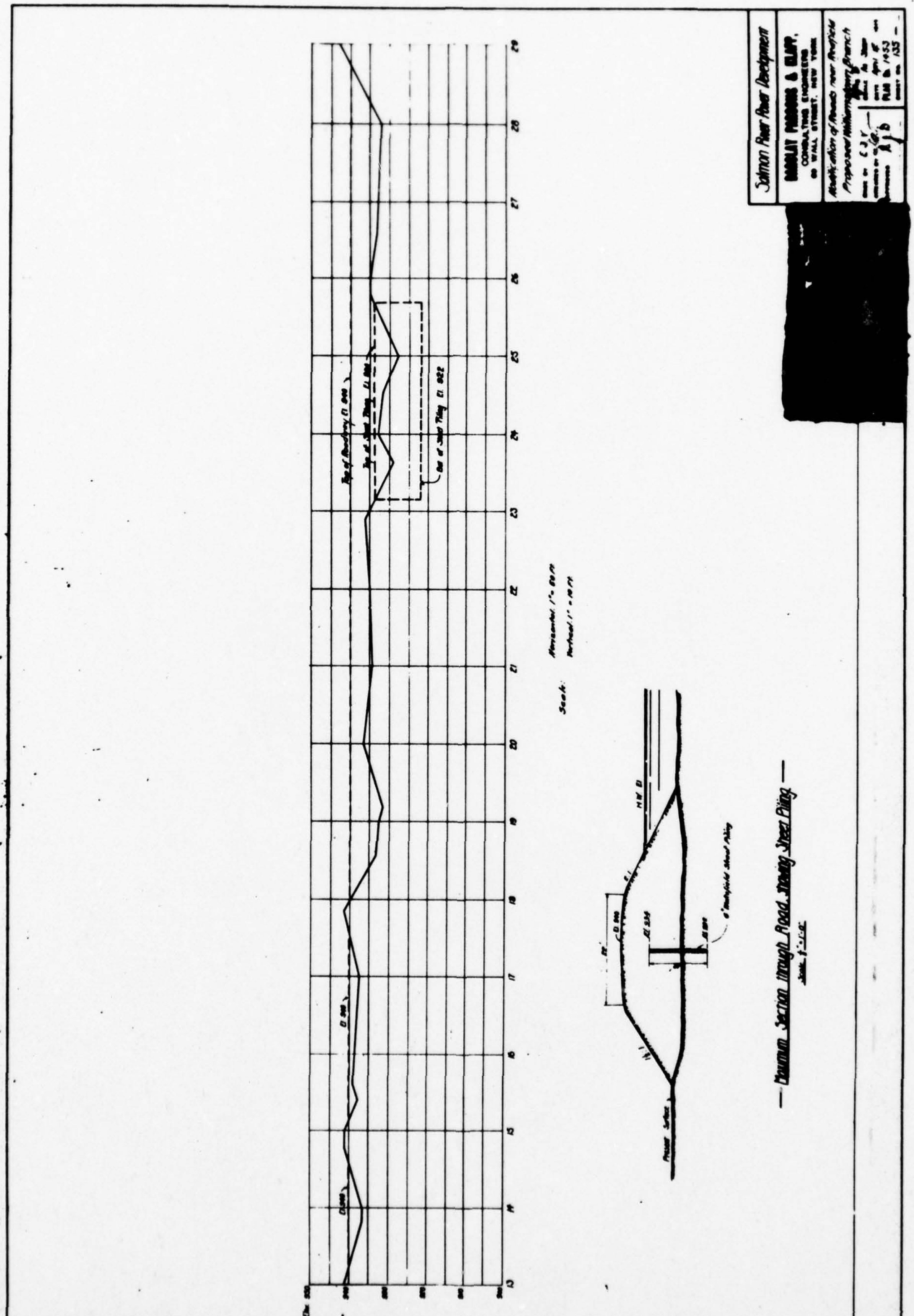
Salmon River Power Development
CONSULTING ENGINEERS
Maximum Section through Road showing Sheet Piling

FIGURE 14

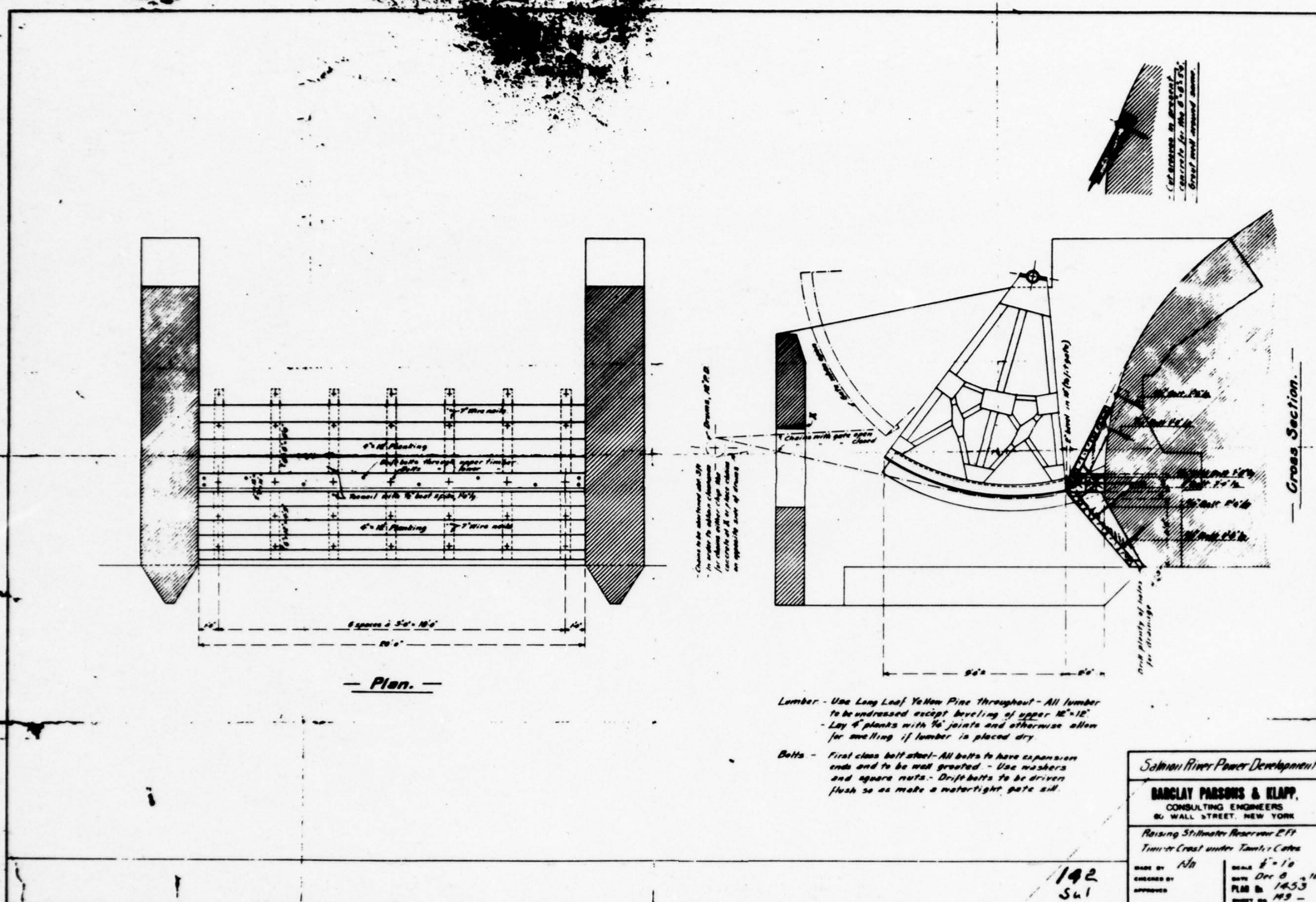
– Cross Section. –
– Plan. –
Lumber - Use Long Leaf Yellow Pine throughout - All lumber to be undressed except beveling of upper 12"×12".
- Lay 4" planks with 1/4" joints and otherwise allow for swelling if lumber is placed dry.
Bolts - First class bolt steel - All bolts to have expansion ends and to be well grouted. - Use washers and square nuts. - Drift bolts to be driven flush so as make a watertight gate sill.
Salmon River Power Development
BARCLAY PARSONS & KLAPP,
CONSULTING ENGINEERS
60 WALL STREET, NEW YORK
Raising Stillwater Reservoir 2 Ft
Timber Crest under Tainter Gates
SCALE 1/4" = 1'0
DATE Dec 8 1910
PLAN No. 1453
142
Sul

FIGURE 15

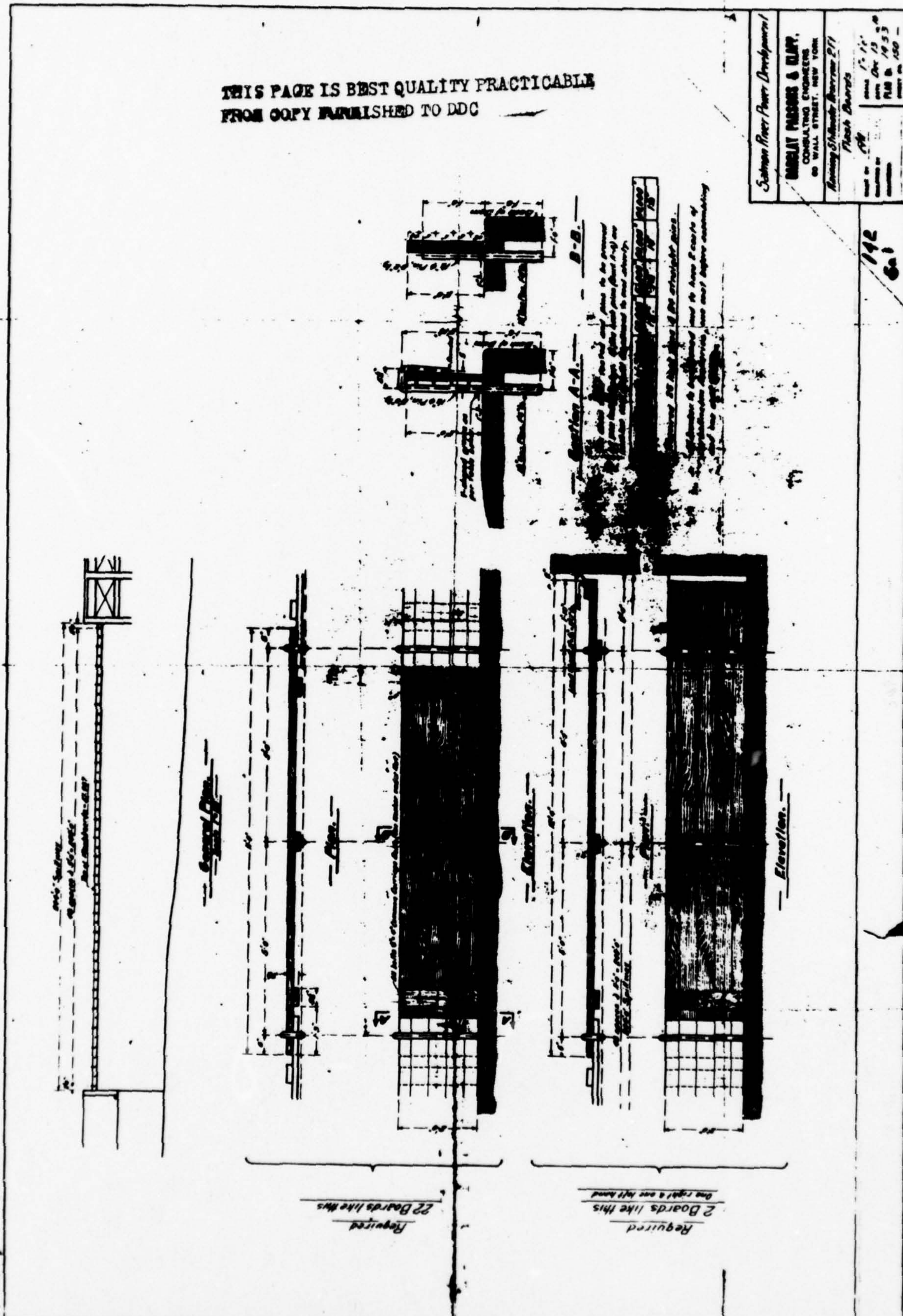
Salmon River Power Development
BARCLAY PARSONS & KLAPP
CONSULTING ENGINEERS
60 WALL STREET, NEW YORK
Flash Boards
Plan
Elevation
Section A-A
Section B-B
Required
22 Boards like this
Required
2 Boards like this
One right & one left hand

FIGURE 16

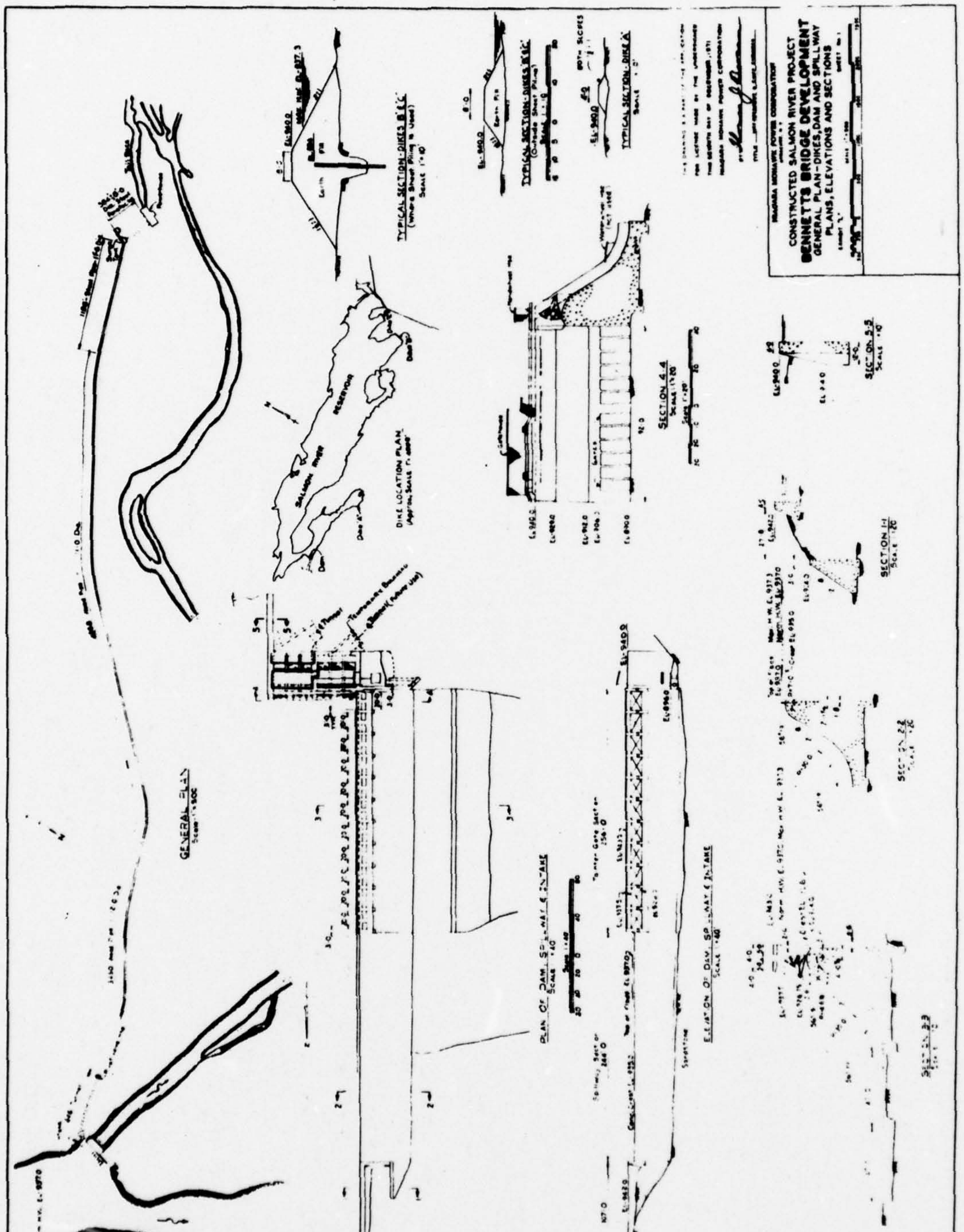
NIAGARA MOHAWK POWER CORPORATION
CONSTRUCTED SALMON RIVER PROJECT
BENNETTS BRIDGE DEVELOPMENT
GENERAL PLAN-DIKES, DAM AND SPILLWAY
PLANS, ELEVATIONS AND SECTIONS
GENERAL PLAN
DIKE LOCATION PLAN
RESERVOIR
SALMON RIVER
TYPICAL SECTION-DIKES B & C
TYPICAL SECTION-DIKE A
SECTION 4-4
SECTION 5-5
SECTION 1-1
SECTION 2-2
SECTION 3-3
PLAN OF DAM, SPILLWAY & INTAKE
ELEVATION OF DAM, SPILLWAY & INTAKE

FIGURE 17

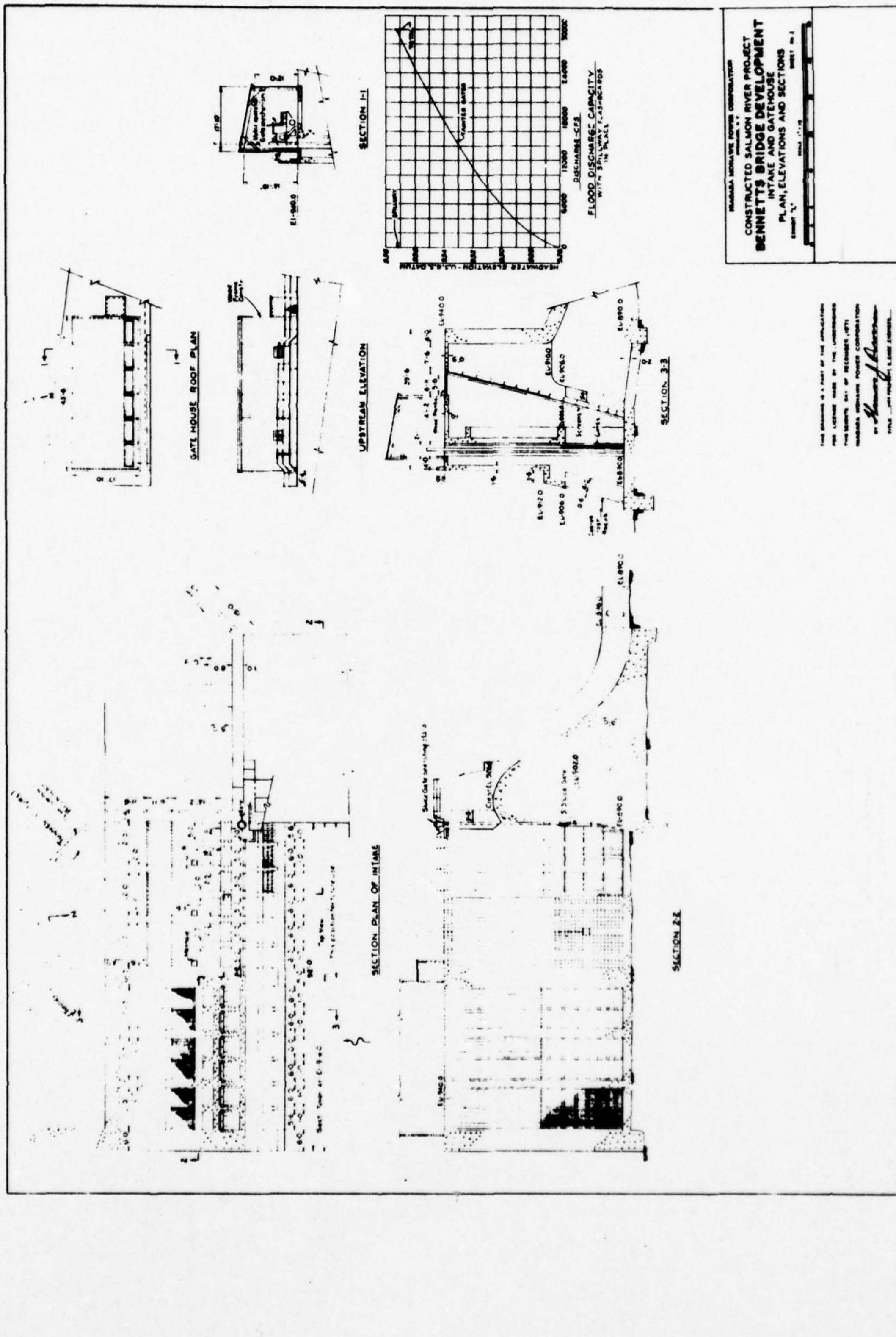
NIAGARA MOHAWK POWER CORPORATION
CONSTRUCTED SALMON RIVER PROJECT
BENNETTS BRIDGE DEVELOPMENT
INTAKE AND GATEHOUSE
PLAN, ELEVATIONS AND SECTIONS
SECTION 1-1
FLOOD DISCHARGE CAPACITY
DISCHARGE-CFS
HEADWATER ELEVATION - U.S.G.S. DATUM
GATE HOUSE ROOF PLAN
UPSTREAM ELEVATION
SECTION 3-3
SECTION PLAN OF INTAKE
SECTION 2-2

FIGURE 18

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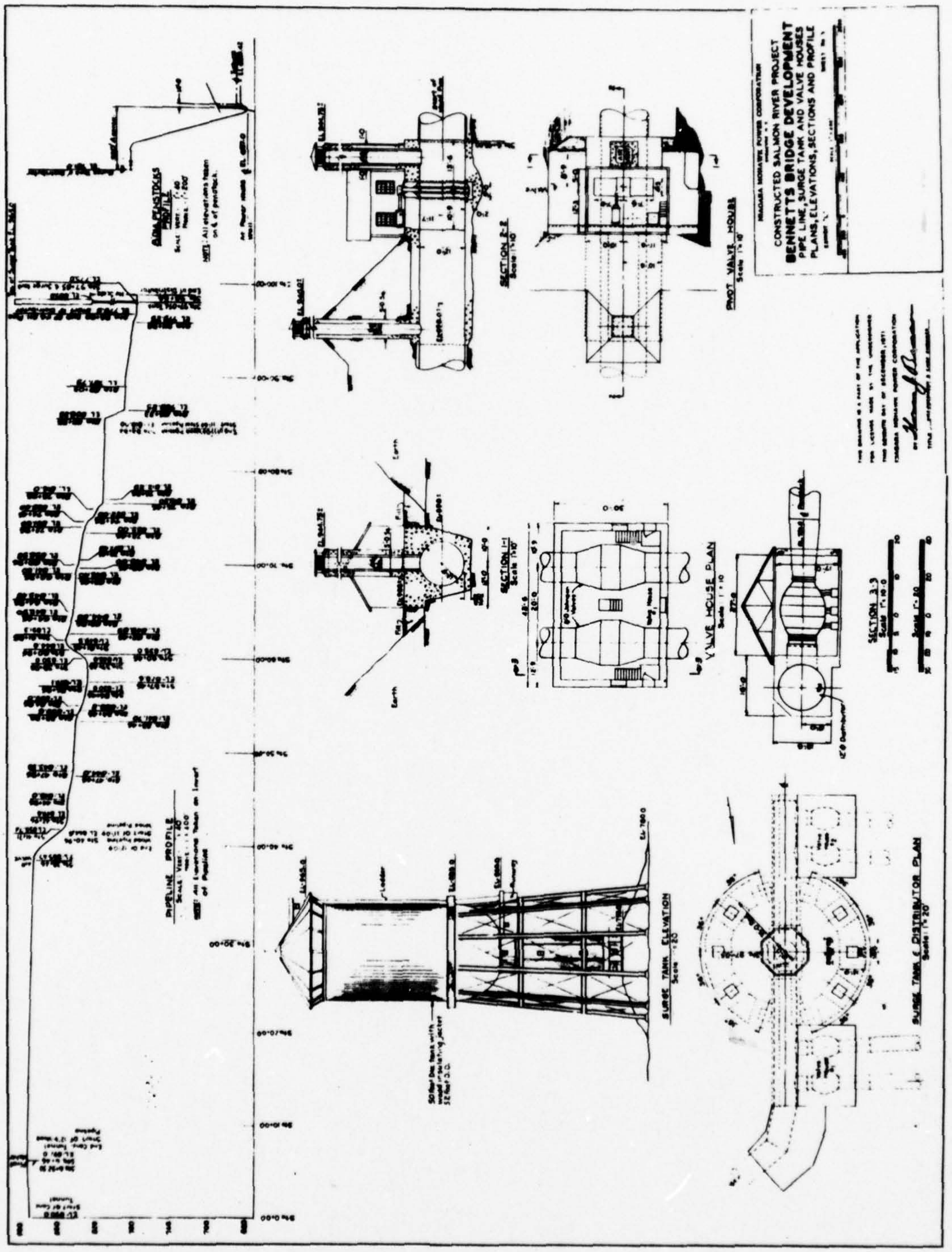

FIGURE 19

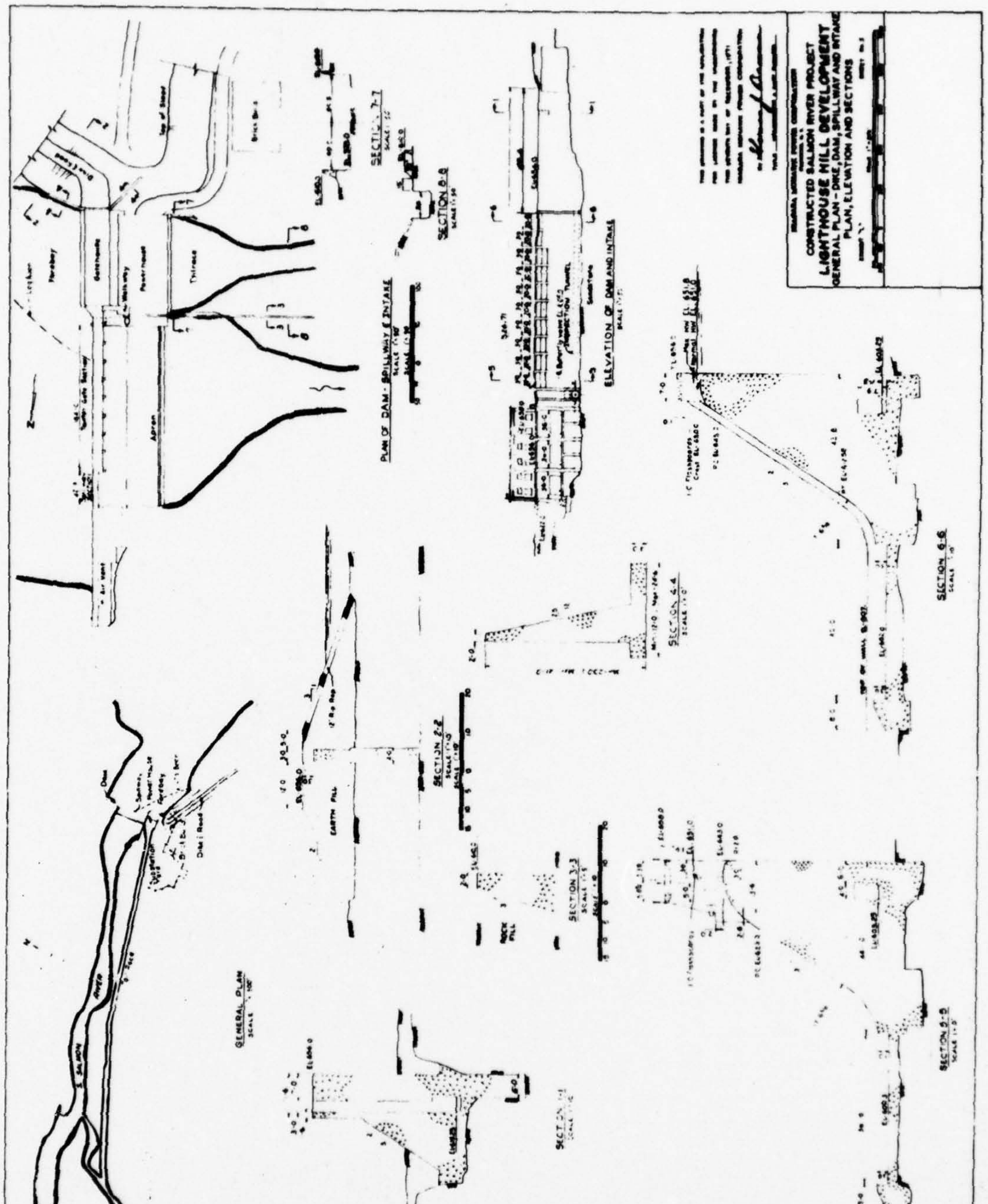

FIGURE 20

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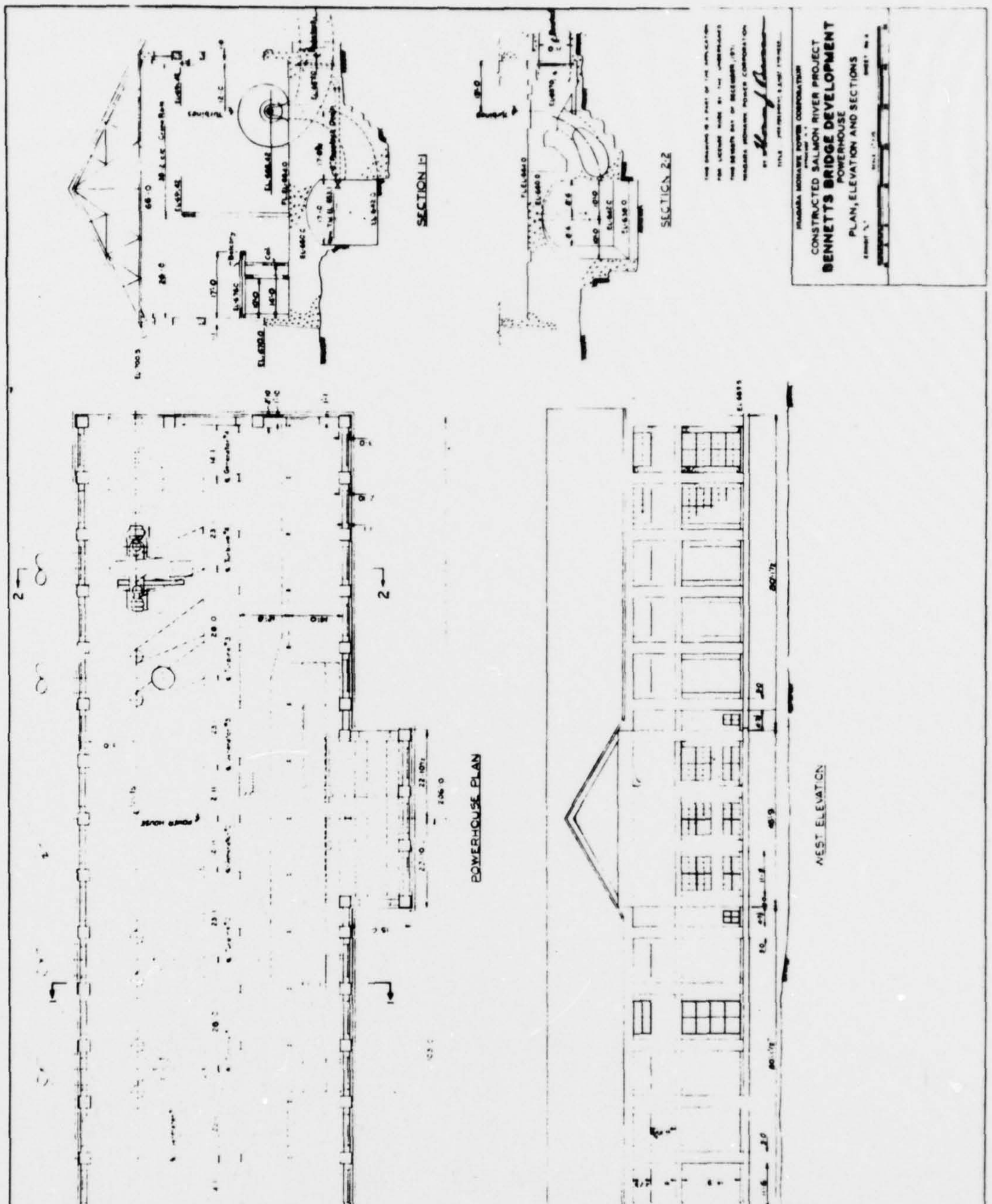


FIGURE 21

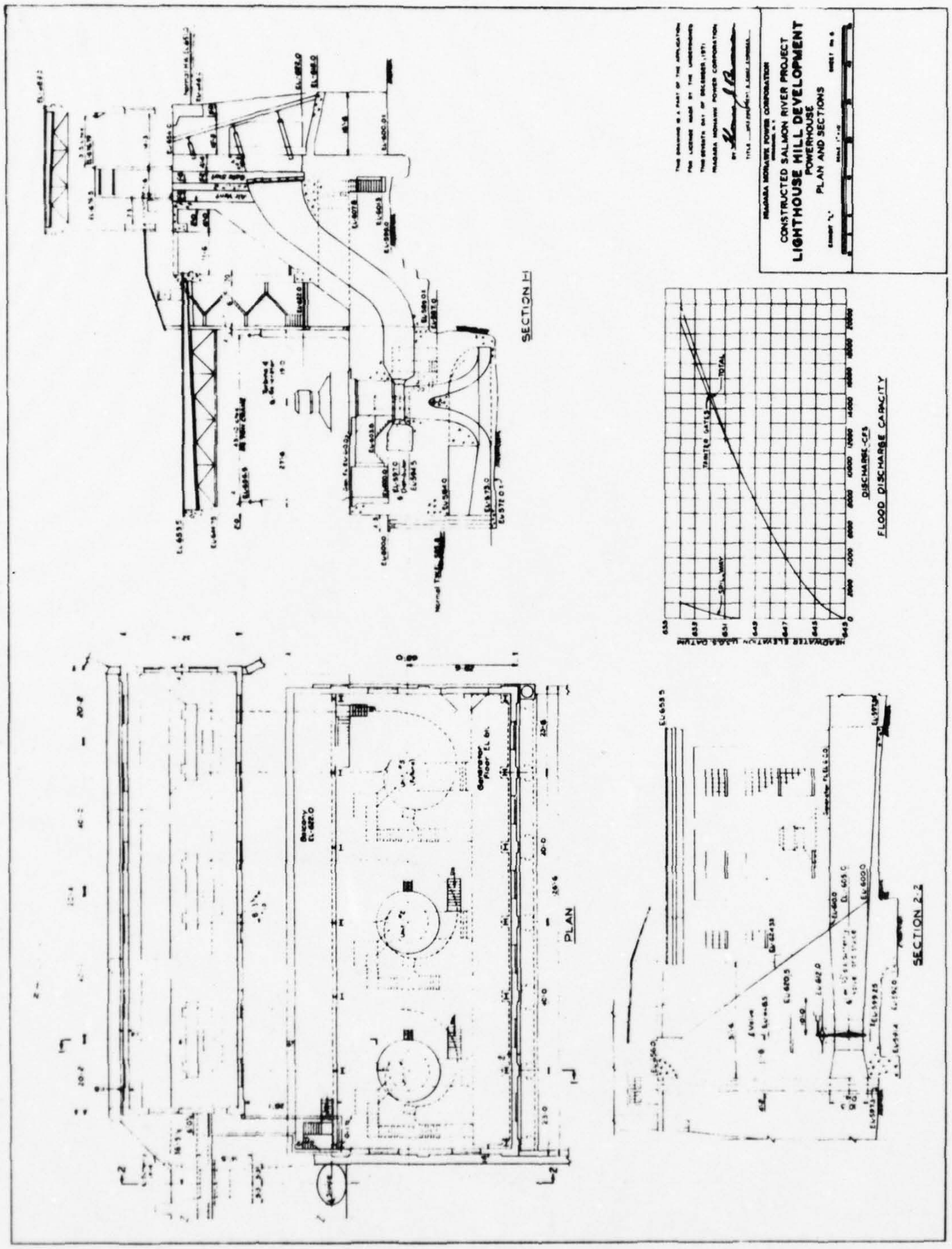
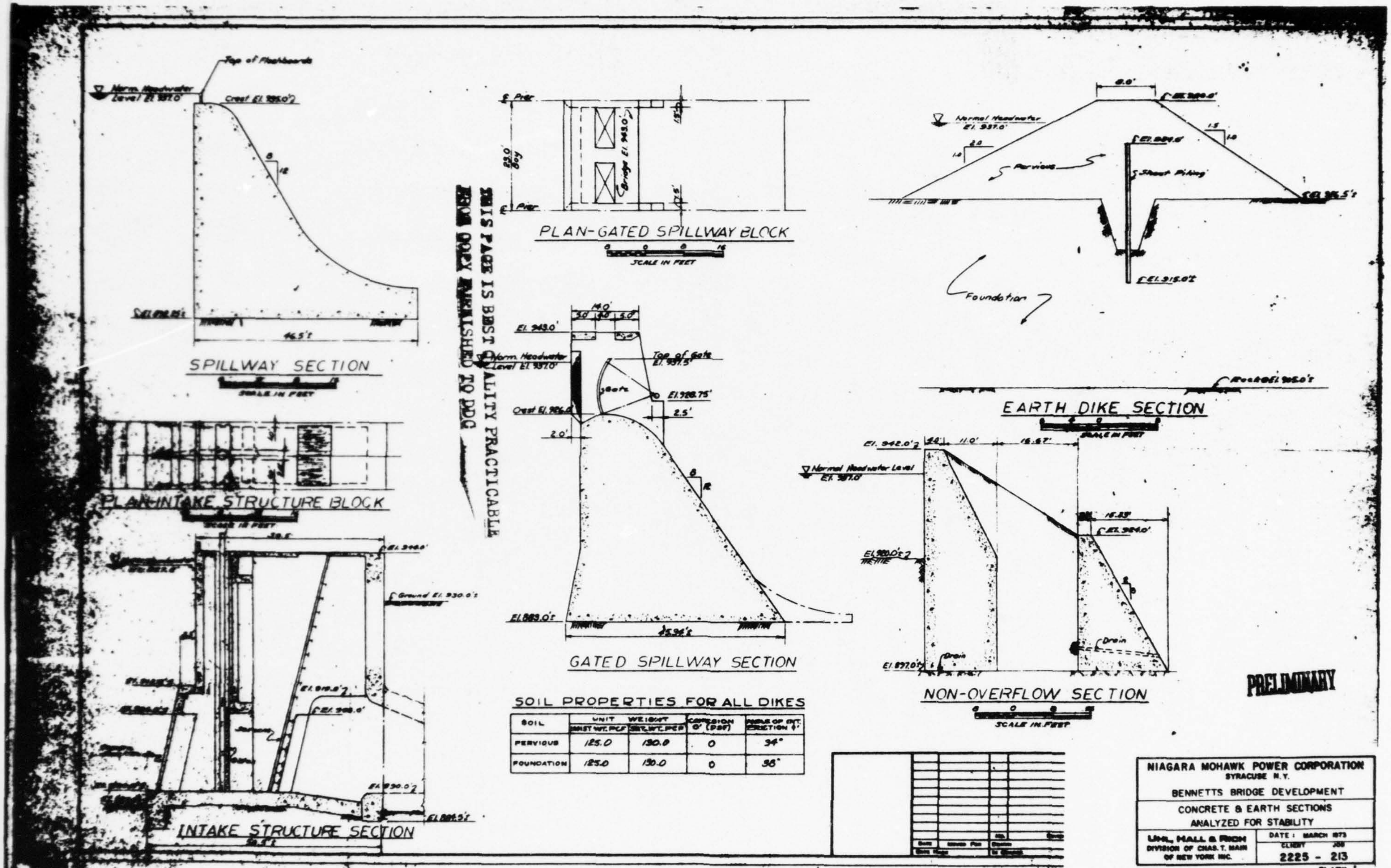

NIAGARA MOHAWK POWER CORPORATION
CONSTRUCTED SALMON RIVER PROJECT
LIGHTHOUSE HILL DEVELOPMENT
POWERHOUSE
PLAN AND SECTIONS
SECTION 1-1
PLAN
SECTION 2-2
DISCHARGE-CFS
FLOOD DISCHARGE CAPACITY

FIGURE 22

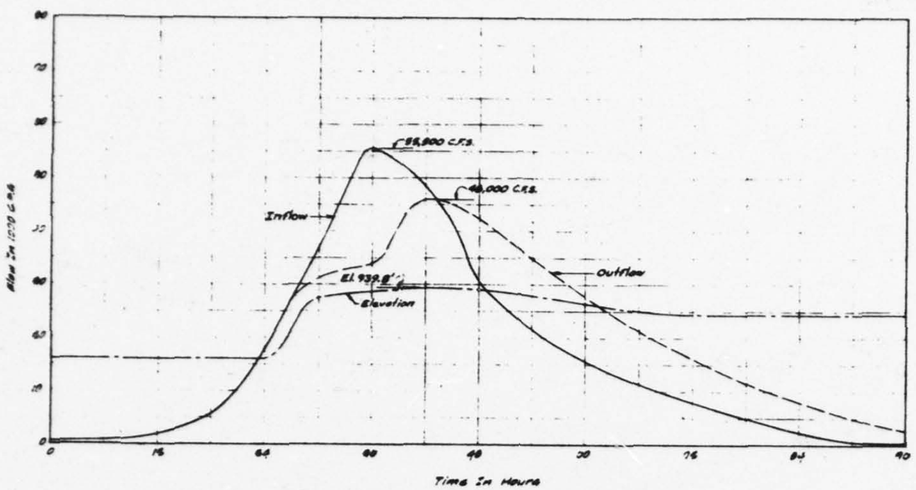


SOIL PROPERTIES FOR ALL DIKES

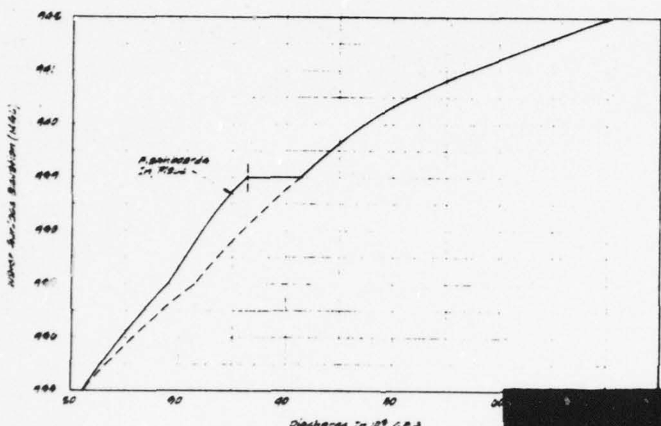
SOIL	UNIT WEIGHT MOIST WT. PCF	UNIT WEIGHT SAT. WT. PCF	COHESION C' (PSF)	ANGLE OF INT. FRICTION φ'
PERVIOUS	125.0	130.0	0	34°
FOUNDATION	125.0	130.0	0	36°

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE N.Y.
BENNETTS BRIDGE DEVELOPMENT
CONCRETE & EARTH SECTIONS ANALYZED FOR STABILITY
UHL, HALL & RICH
DIVISION OF CHAS. T. MAIN OF NEW YORK INC.
DATE: MARCH 1973
CLIENT JOB
2225 - 213
PLATE 1

FIGURE ?23



BENNETTS BRIDGE DEVELOPMENT



BENNETTS BRIDGE DEVELOP[redacted]

PRELIMINARY

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE N.Y.

BENNETTS BRIDGE DEVELOPMENT

HYDROGRAPHS PROJECT FLOOD ROUTING & INDIVIDUAL DISCHARGE CURVES

UHL, HALL & RICH
DIVISION OF CHAS. T. MAIN OF NEW YORK INC.

DATE: MARCH 1973

2226 - 213

FIGURE 24

APPENDIX A

FIELD INSPECTION REPORT

CHECK LIST
VISUAL INSPECTION

PHASE 1

Name Dam SALMON RIVER County OSWEGO State NEW YORK ID # 374

Type of Dam CONCRETE GRAVITY & DIKES Hazard Category HIGH

Date(s) Inspection SEPT. 12, 1978 Weather SUNNY Temperature 65^{o} F.

Pool Elevation at Time of Inspection 930 M.S.L. Tailwater at Time of Inspection --

Inspection Personnel:

F. W. BYSZEWSKI	DALE ENGINEERING CO.	
N. F. DUNLEVY	DALE ENGINEERING CO.	
D. F. McCARTHY	DALE ENGINEERING CO.	
R. LEVETT	NIAGARA MOHAWK POWER CORP.	

N. F. DUNLEVY Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Wetness in south abutment and some flow noticeable (possibly from 2 to 3 inches of rainfall the night before).	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	See comment above.	
DRAINS	Reportedly underdrains were installed recently between old spillway concrete surface and new spillway concrete surface at the uncontrolled spillway.	
WATER PASSAGES	---------	
FOUNDATION	Observations did not indicate any noticeable foundation problems; e.i., movement or sloughing of earth below toe.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	The dam's surface had been gunited many years ago (perhaps 30 years ago according to Mr. Levett). Surface cracks relating to gunite material were evident on the downside of the gated spillway area.	The ungated spillway was repaired within the last five years and shows little or no surface cracks. That part of the dam's downstream face is in good condition.
STRUCTURAL CRACKING	A substantial portion of the dam is covered with gunite material. Some of this material is cracked as shown above. It can not be determined if hidden cracks exist.	As part of the repair work listed above, concrete cores were taken through the dam. If this report is available, it will be reviewed and commented on in this report.
VERTICAL & HORIZONTAL ALIGNMENT	The dam is not out of alignment according to the visual inspection.	
MONOLITH JOINTS	Some joints were noted. All seemed to be in good condition (not showing seepage or concrete spalling, etc.).	
CONSTRUCTION JOINTS	None visible.	
STAFF GAGE OF RECORDER	Elevation 930 at time of inspection.	

EMBANKMENT

DIKES

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None noted.	Comments are general; they are representative of the dike areas and do not address specific locations along a particular dike.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted. In some locations the toe area is not drained and there is water standing along the dike.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None noted.	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Reasonably good.	
RIPRAP FAILURES	Riprap in generally good condition. Some minor sloughing noted.	

EMBANKMENT

DIKES

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
COVER CROP	The entire dike system is treed along the top and downstream face.	These trees may affect the stability of the dam. See report discussion.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	N/A	
ANY NOTICEABLE SEEPAGE	None. However, there was little or no head on the dikes at the time of inspection.	
STAFF GAGE AND RECORDER	None.	
DRAINS	None.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Overflow weir on north abutment with flashboards with a top elevation of 937. Surface was recently capped and is in good condition.	
APPROACH CHANNEL	The upstream channel is the reservoir surface which contains a log boom across the face of the reservoir.	
DISCHARGE CHANNEL	The spillway is built into the downstream face of the dam with an apron which empties into original ground. This surface has a slight grade towards the main channel.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	11 Tainter gates are located on the south section of the dam. Some minor leakage was noted. The concrete sills were not readily visible from the deck area above the gates. Some inspections were made with no sill problems evident.	The gates are operated annually in the spring of the year. They are adjusted to satisfy flow conditions in the reservoir rather than a regulation schedule. A telemetry readout at the power house alerts the staff of increasing stages.
APPROACH CHANNEL	The approach channel is the upstream reservoir. A log boom is located across the face of the dam.	
DISCHARGE CHANNEL	The gates control discharge over a sharp crested weir section built into the downstream face of the dam. Below the weir is a sizable stilling basin centered in the natural channel stream section.	
BRIDGE AND PIERS	The tainter gates are supporte by piers. The northern pier has recently been replaced.	
GATES AND OPERATION EQUIPMENT		

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Outlet conduit is a wood staved pipe which supplies hydro turbines supplying peak power.	The staved pipe is scheduled for replacement in 1980. It has been in operation since 1914 and the owner's staff says it needs to be replaced.
INTAKE STRUCTURE	Concrete intake structure built into the south abutment. The exterior surface is in good condition.	
OUTLET STRUCTURE	The outlet structure is under Bennett's Bridge Power House. The outlet has a wood closure and significant discharge was occurring at the time of inspection.	A mud blow-out pipe exists at the dam but has never been used. The only was to draw down the reservoir is through the power house. way
OUTLET CHANNEL	The outlet channel below the Bennett Bridge Station consisted of the natural stream channel. It was clear and unobstructed at the time of inspection.	
EMERGENCY GATE		

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No obstruction, erosion or debris were evident.	
SLOPES	Immediate slope is 40 feet per mile. Located one mile downstream is a 100-foot waterfall known as Salmon River Falls.	
APPROXIMATE NO. OF HOMES AND POPULATION	The Village of Altmar, located on Route 13, is 5 miles downstream. A number of businesses and homes would be affected.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None known.	
OBSERVATION WELLS	None known.	
WEIRS	None known.	
PIEZOMETERS	None known.	
OTHER	Telemetry system provides continuous readout on reservoir water level at dam to operator at the Bennett Station Plant.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	No significant slopes border the reservoir. The reservoir is largely perched on high ground.	
SEDIMENTATION	No apparent problem. No buildup was noticed either upstream or downstream of the dam.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM Salmon River Dam & Dike

ID # 374

ITEM	REMARKS
AS-BUILT DRAWINGS	Sheets included in this report reflect as-builts of original dam construction.
REGIONAL VICINITY MAP	See Figure 1.
CONSTRUCTION HISTORY	Contact Niagara Mohawk office.
TYPICAL SECTIONS OF DAM	See this report.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See this report for available data.
RAINFALL/RESERVOIR RECORDS	Non-recording data at Bennett Bridge Station.

ITEM	REMARKS
DESIGN REPORTS	See Niagara Mohawk. Some data on future improvements included herein.
GEOLOGY REPORTS	See Niagara Mohawk. Some data on future improvements included herein.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	See Niagara Mohawk. Some data on future improvements included herein.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	See Niagara Mohawk.
POST-CONSTRUCTION SURVEYS OF DAM	See Niagara Mohawk.
BORROW SOURCES	Not applicable.

ITEM	REMARKS
MONITORING SYSTEMS	Telemetry system.
MODIFICATIONS	See report enclosed herein on future modifications.
HIGH POOL RECORDS	See Niagara Mohawk.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	See Niagara Mohawk.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	See Niagara Mohawk.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	See this report.
OPERATING EQUIPMENT PLANS & DETAILS	See this report for available data.

CHECK LIST
HYDROLOGIC & HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 193.4 sq. mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 935 spillway crest
937 flashboards crest

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 935/937

ELEVATION MAXIMUM DESIGN POOL: ----

ELEVATION TOP DAM: 942 top of dam, 940 top of dikes

CREST: (Spillway)

		Uncontrolled	Gated
a.	Elevation	935	926
b.	Type	Ogee	Ogee
c.	Width		220
d.	Length	7'	13.5'
e.	Location Spillover	North End	South End
f.	Number and Type of Gates	--	11

OUTLET WORKS:

a. Type 11-12 ft. wood staved conduit to power house.
b. Location South abutment.
c. Entrance Inverts 890
d. Exit Inverts ---
e. Emergency Draindown Facilities Mud blow-out pipe never used.

HYDROMETEOROLOGICAL GATES:

a. Type -- Telemetry system provides readout.
b. Location -- of reservoir stages to staff at power
c. Records -- house. Gate controls are at dam.

MAXIMUM NON-DAMAGING DISCHARGE: ---

APPENDIX B

PREVIOUS INSPECTION REPORTS

AND CORRESPONDENCE

INSPECTION OF DRILLING, GROUTING AND REPAIR

BENNETTS BRIDGE DAM

NIAGARA MOHAWK POWER CORPORATION

OSWEGO COUNTY, NEW YORK

Bennetts Bridge Dam and Hydro Station is located on the Salmon River in Oswego County, New York, approximately 11 miles due west of the City of Pulaski. It was built early in the 20th century and consists of an intake structure upstream of the dam on the left bank, and two contiguous spillways, one gated with a crest elevation of 926 feet, the other ungated with a crest elevation of 935 feet. The ungated section and the right abutment is 251 feet long, while the gated section with 11 gates and piers is 256 feet in length. The ungated section is provided with flashboards to elevation 937. The maximum depth of water, measured from the top of the flashboards, is approximately 52 feet.

In 1914, shortly after completion of the original spillway, the ungated section was raised from elevation 924 to its present height. It is not known if additional concrete was added to the face of the spillways at that time.

Later, a layer of gunite with wire mesh was placed over the spillway face, and portions of the upstream face of the dam that could be reached.

The water is conducted to the four unit powerhouse at the village of Bennetts Bridge via the intake structure behind the dam, through a short section of tunnel, and then through about one mile of wood stave penstock to a surge tank. Conduit materials in the vicinity of the surge tanks and penstocks were not noted.

GENERAL GEOLOGY

The entire site was subjected to continental type glaciation during the Pleistocene, and the bedrock is usually concealed by varying thicknesses of boulder till, by ground, lateral and terminal moraine, and by different forms of outwash such as kames and eskers.

The bedrock formation underlying the area is the quartzitic Oswego sandstone of Ordovician age. At the toe of the dam, it is well exposed and consists of a dense, moderately laminated, fine grain sandstone grading to an even finer grade siltstone of the same chemical composition. It is a hard, durable, insoluble rock, affording an excellent foundation for the structure. The laminations allow it to break into thin slabs when subjected

to weathering, but where it is protected as in the foundation of an hydraulic structure, it will not deteriorate nor will it allow leakage to increase with the passage of time unless there are weathered, horizontal seams. No such defects were found during the investigations.

PRESENT REHABILITATION PROGRAM

While no serious leakage or structural problems were reported to have been experienced in the past few years, the disintegration of the gunite layer on the crest and ogee sections of the two spillways, and the questionable quality of part of the added crest section in the ungated portion along with the contact zone between the two last lifts has caused some concern.

In order to prevent further damage, and to insure the future stability of the structure, Niagara Mohawk embarked on a program of inspection, testing and repair. Lee Turzillo Contractors of Cleveland, Ohio, was employed to drill and grout and to perform some repair work under Niagara Mohawk Specifications CS-43 C99 dated May 1972 and Addendum No 1 dated June 14, 1972.

Prior to the completion of the testing phase, the undersigned was engaged to observe the operations of the contractor, log the core, inspect available records and evaluate the effectiveness of the grouting program. The visit to the site was made on September 25 through 27.

Sketches furnished by Niagara Mohawk showed 45 planned exploratory and grout holes, of which 21 were to be cored. Seven of the core holes were to be drilled into the bedrock of the foundation. The balance were to be drilled into concrete only. Most holes were to be water pressure tested, according to the specifications. Some modification of the original layout was made in the field to accommodate existing conditions.

Nineteen of the core holes were examined and logged, with special attention directed to the condition of the concrete. Information regarding seven more holes was obtained from the driller's and inspector's daily reports, as the cores were not available for inspection. An additional four 4" diameter thin-wall bit holes were planned to obtain samples for unconfined compressive strength tests. No records of the holes drilled since September 27 have been received, nor have any of the grouting, pressure testing or compression test results since that date been received.

EVALUATION OF PROGRAM

The work performed up to September 27 and logged and/or inspected by the undersigned indicates that the mass concrete of the two original spillways, while not of outstanding quality, is basically sound. The 11 feet of concrete added to the crest of the ungated spillway section in 1914 was apparently added in two approximately 5 to 6 foot lifts and the upper lift seems to be somewhat inferior and less durable. Examination of the drill cores from the crest showed a decided change in the character of the concrete between 5 and 6 feet. (See logs of drill holes A-2, A-5, A-9 and A-12).

The gunite facings of the ogee sections, subjected to extremes of temperature and to erosive flows during spillage, have completely disintegrated and fallen away over a good percentage of the surface. The gunite facing on the vertical upstream face of the dam, on the other hand, without the same exposure extremes and not subject to erosion, is in comparatively good condition.

Construction and/or expansion joints, viewed at a time when the pool was at or near minimum operating level, indicated only scattered and minor seepage. There were no visible signs to suggest that significant or dangerous leakage has occurred when the reservoir was at higher levels.

The most obvious manifestation of the age and service of the structure is the disintegration of the gunite and the spillway face concrete. The condition is widespread over the ungated section and only a little less so over the gated section.

Drill cores through the crest and from the face of the ogee spillway revealed that some leaching of the cementing material has occurred over the years and to a depth of about two feet. The well rounded natural aggregate particles broke loose from the encasing cement rather easily in samples taken from or within a couple of feet of the surface. The breaking resistance between the aggregate and the cement generally increased with increasing depth.

Where cores penetrated the cement-rock contact in the trench at the heel of the dam, the contact zone was usually recovered intact, indicating an excellent bond.

A short field test was made in spillway block No. 4, near drill hole 4-B, using a small, air operated hammer with a chisel point, to attempt to see something of the "toughness" of the concrete. In spite of a shortage of air with which to operate the hammer efficiently, the workman was able to excavate about 1/4 of a cubic foot in a few minutes, to a depth of from 8" to 10".

CONCLUSIONS AND RECOMMENDATIONS

Based on the information available, including drill cores, pressure and grouting tests, and personal observation, it is the opinion of the undersigned that the faces of the spillway sections, the raised crest portion of the ungated spillway and other disintegrated concrete should be removed and replaced with new, reinforced and pinned concrete to the original dimensions.

1 - It is recommended that the concrete of the existing crest of the ungated spillway be removed to elevation 929 or lower if necessary; and that new concrete, adequately reinforced and pinned to the older structure, be placed.

2 - The deteriorated concrete of the ogee sections of the two spillways should be removed to a minimum depth of one foot and up to two feet where necessity dictates, and that new concrete be placed to conform with the original contours, also reinforced and pinned.

3 - Depending on an analysis by a qualified structural engineer, it is tentatively recommended that the construction and/or expansion joints be sealed by pressure grouting.

4 - It is recommended that conventional forms and concrete placement be used, as the PAC or so-called pre-Pakt type may leave pockets of aggregate without cement bond, pockets which would be extremely susceptible to freezing and thawing and erosion during spillage.

Charles P. Benziger

C. P. Benziger
Chief Geologist

CPB:elt

UHL, HALL & RICH

DIVISION OF CHAS. T. MAIN OF NEW YORK, INC.

Boston, Massachusetts

PROJECT BENNETTS BRIDGE
CLIENT NIAGARA-MOHAWK POWER CORP.

EXPLORATION LOG

E NO. A-4	LOCATION SPILLWAY	SURF. ELEV. 935.0
LE VERT.	BEARING —	ELEV. OF ROCK 889.5
; STARTED —	DATE COMPLETED 8/24/72	ELEV. OF BOTTOM HOLE [illegible]
TRACTOR TERZILLO	DRILLER PHILLIPS	LOGGED BY: DRILLER?
ER SURF. ELEV	SIZE OF CORE EX	SHEET 1 OF 1

ELEV. OM	ELEV. TO	DEPTH FROM	DEPTH TO	DESCRIPTION: Include Blow Count, Sample No., etc.
935.0	889.5	0.0	45.5	CONCRETE — 3.5' of CORE LOSS IN FIRST 20.8' of DRILLING.
889.5	886.5	45.5	48.5	BEDROCK CALLED LIMESTONE ON INSPECTORS REPORT, BUT IS SILTSTONE.
886.5		48.5		BOTTOM of HOLE
				NOTE:
				TOTAL WATER LOSS REPORTED AT 23.7'.
				CORES NOT AVAILABLE FOR LOGGING, INFORMATION FROM DRILLERS LOGS AND INSPECTORS REPORT.

NIAGARA MOHAWK POWER CORPORATION

SPILLWAY ADEQUACY AND STABILITY ANALYSIS

FOR

BENNETTS BRIDGE DEVELOPMENT

PRELIMINARY

UHL, HALL & RICH, ENGINEERS
BOSTON, MASSACHUSETTS

JULY 1973

W. M. HALL
G. R. RICH
W. J. LESSARD
C. A. DAUBER
WM. BAUMRUCKER

UHL, HALL & RICH
DIVISION OF CHAS. T. MAIN OF NEW YORK, INC.
Engineers
LINCOLN BUILDING, 60 EAST 42ND STREET, NEW YORK, NEW YORK 10017

Please reply to:
Southeast Tower,
Prudential Center,
Boston, Mass. 02199
Tel: 617-262-6140

July 9, 1973 2225-213

SUBJECT: Report on Spillway Adequacy and Stability Analysis for Bennetts Bridge Development

Mr. Philip D. Raymond, Vice President-Engineering
Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, New York 13202

Dear Mr. Raymond:

We are pleased to submit herewith our report on the "Spillway Adequacy and Stability Analysis for Bennetts Bridge Development". The studies and resulting report were performed at the request of Mr. Robert J. Levett, Structural Design Engineer, through his authorizing letter of 9 March 1973.

The results of our study with regard to structural stability indicate that all concrete structures are stable against the loadings assumed.

The results of the Porbable Maximum Flood (PMF) analysis indicate that the earthen dikes will be overtopped by 1.8 feet, resulting in the eroding away of the downstream slope and most likely, disrupting the wooden sheet pile cutoff. The failure of this cutoff would lead to the total breaching of the dikes.

The Project Flood analysis results in a freeboard of 1.1 feet, sufficient to prevent the direct overtopping of the dikes without considering the effects of wave action.

The results of the stability analyses indicate that the dike(s) slope(s) are unstable for the seismic, project flood, and rapid drawdown cases.

At the request of Mr. Levett, a brief study was made to arrive at recommendations concerning modifications to the dike(s) to accommodate the loadings assumed with adequate safety factors. These recommendations are included with the report and may be used by Niagara Mohawk in conjunction with legal and economic considerations in arriving at a solution to correcting the dikes deficiencies.

We trust that you will find the report satisfactory and complete. Should you have any further questions on its content, please do not hesitate to contact us.

Very truly yours,

UHL, HALL & RICH

J. C. Matte

RAH/mf

TABLE OF CONTENTS

SUMMARY

This report has been prepared in accordance with the request of Niagara Mohawk Power Corporation for information relative to spillway adequacy and stability of water retaining structures for the Bennetts Bridge Development. Such information is intended to be supplemental to the license application exhibits.

Studies were initiated to determine for the Development the Probable Maximum Flood and the Project Flood. The Project Flood was used to check the adequacy of the spillway sections and to determine the available freeboard during the flood. The results of these studies show that the freeboard for the Project Flood is 1.1 feet. Stability analyses of the embankment section, though, indicate that slope failures of the downstream slope will occur under this flood condition. The slope failures will extend into the upstream slope, causing breaching of the dike.

Recommendations are presented concerning the modifications to the embankments that, if followed, would allow the dikes to sustain a flood of Project Flood magnitude.

SPILLWAY ADEQUACY AND OVERTOPPING

The subject development on the Salmon River commands a drainage area of 188 square miles. As there are no U.S.G.S. stream gaging stations on this river, the East Branch of Fish Creek, which has a U.S.G.S. stream gage at Taberg with a drainage area of 188 square miles and a period of record extending from 1923 to date, was used to develop a unit hydrograph.

Utilizing several non-snowmelt events, data from the Fish Creek gage was used to derive unit hydrographs. The unit hydrograph selected for use in this study was derived from the flow of October, 1945.

The Probable Maximum Precipitation values as given in the Joint U.S. Corps of Engineers-U.S. Weather Bureau Hydrometeorological Report #33, were modified for infiltration losses to give six-hour incremental rainfall excess figures. These rainfall excess values were applied to the derived unit hydrograph to give a Probable Maximum Flood (PMF) hydrograph as inflow into the reservoir. Assuming the reservoir at the normal maximum level of elevation 937.0, the PMF transited the reservoir with a maximum inflow of 73,900 cfs, a maximum outflow of 67,000 cfs and a maximum reservoir elevation of 941.8. The results of this study are presented in Appendix B.

This routing of the PMF would cause overtopping of the dikes by about 1.8 feet. Study of the topography, both on maps and on the ground, have led to the conclusion that the overtopping of the 'B' and 'C' dikes would cause failure and the resulting breaching flood would transit the swamp and flow into a branch of the Mad River and then into another basin. It should be noted that the 'A' dike will also be breached.

The breaching hydrograph was taken as triangular in shape with an assumed base width of 14 hours. Assuming failure down to the top of the wood sheet piling, used as a core wall, and emptying the reservoir to the same elevation gave a peak outflow of 47,000 cfs.

It should be noted that in all likelihood, portions of the sheet piling cutoff will fail, allowing the dike to be breached completely. This event will occur well after the peak outflow due to the fact that time is required to erode the supporting fill downstream of the cutoff, and will thus lower the reservoir level even further.

While such a flood as that resulting from the dike breaching would be damaging, the flood plain development in the basin appears sparse and the incremental damage suffered would be minimal when compared with the damage caused by the flood generated by the Probable Maximum storm in that basin.

In view of the current practice in both the private and public sectors of using a Project Flood for spillway design, such an approach was considered for this project.

Some Federal agencies take the Project Flood as varying between 40 to 60 percent of the Probable Maximum Flood with the percentage adopted being dependent upon downstream development. In this case, a Project Flood of 55,500 cfs or 75 percent of the Probable Maximum Flood was taken as inflow to the project. This Project Flood was routed through the reservoir with a peak outflow of 46,000 cfs and a maximum pond elevation of 938.9. This flood, which did not breach any of the ancillary dikes, is about 4 times the flood of record as prorated from the East Branch of Fish Creek at Taberg and was judged as being an adequate test for spillway adequacy.

Studies indicate that even with the Project Flood, saturation failure of a more gradual nature than that resulting from the overtopping case would cause the dikes to fail. Such a flood, resulting from the dikes failure, would cause very little damage in the East Fish Creek Basin.

STABILITY OF STRUCTURES

Concrete Structures

A stability analysis of all concrete water retaining structures was performed for normal operating conditions, ice conditions, seismic conditions, and flood conditions.

Plates II and III outline the cases and design assumptions used. Plate IV summarizes in tabular form the values derived from the analysis. All plates are found in Appendix A.

The safety factors of the structures were checked with respect to overturning and sliding at their bases, and computations were made to check the foundation pressures at this elevation.

The safety factor with respect to overturning is the ratio of the forces (the weight of structure) times their lever arms (moments) tending to prevent the structure from tipping to the forces (moments) tending to tip the structure (the water pressure exerted on the upstream face and beneath the structure). Any safety factor that is equal to 1.0 would theoretically indicate that the structure is stable, with any lesser value placing it at the verge of being unstable. By referring to Plate IV, under the column headed $\sum M_r / \sum M_o$, for all cases considered, the structures are stable with respect to overturning.

The safety factor with respect to sliding including shear-friction resistance is the ratio of the forces tending to resist sliding; namely, the frictional resistance due to the net weight of the structure sliding along its base and the resistance due to the shearing strength developed between the structure and its rock foundation, and the forces tending to promote sliding; namely, the water pressure at the upstream face. It is normally accepted that this ratio be a minimum 5.0. By referring to Plate IV, under the column headed S_{s-f} for all cases considered, the structures are stable with respect to sliding.

Based on the results of the analyses performed, we find the Development's concrete structures are stable against the expected loadings as assumed.

Earthen Structures

A stability analysis of the Development's earthen dikes was performed using a program developed for the IBM 1130-16K computer system. The program is based on a modified Bishop method of analysis, using cylindrical failure surfaces and assumed effective stress soil parameters. The safety factor derived from the modified Bishop method of analysis is currently considered most nearly representative of the "true" safety factor of the slope as compared to safety factors derived from other methods of analysis.

The following cases were chosen for analysis: normal operating conditions for the upstream and downstream slopes; normal operating conditions with seismic conditions for the upstream and downstream slopes, and rapid drawdown for the upstream slope.

Plate I depicts the typical embankment section chosen for analysis and lists the soil properties used in the analysis, Plate VI lists other values and assumptions, Plate VII lists in tabular form the results of the analysis. All plates are found in Appendix A.

The results of the analysis show that for several cases considered, the dikes are unstable against the loadings assumed.

Recommendations Concerning Earthen Structures

At the request of Mr. Levett, a brief study was initiated to determine what modifications would necessarily have to be performed in order to stabilize the dikes against a flood of Project Flood magnitude.

The results of that study indicate that if the following modifications are made to the existing dikes, their downstream slopes will be stable against the loadings assumed:

(1) Remove the topsoil from the downstream and upstream slopes and place a clean, 2 ft. thick well graded sandy drainage blanket at the downstream slope followed by well compacted pit-run sandy fill finished to 2H:1V.

(2) Raise the height of dikes to El. 946.0, 6 feet above the present level.

(3) Increase the crest width to 14 feet.

(4) Add filter and riprap to the upstream slope extending between El. 934 and El. 946.

(5) Place topsoil on the downstream slope and crest, then fertilize and seed.

Modifications of the upstream slope to resist rapid drawdown were not considered since it is thought that only local sluffing would result without breaching and the slope could be repaired after the sluffing had occurred.

APPENDIX A

STABILITY ANALYSES

PRELIMINARY

CASES USED IN STABILITY ANALYSIS
CONCRETE SECTIONS

CASE I	Normal Operating Levels		
	H.W.C.	=	937.0
	T.W.L.	=	-
	Uplift included		
CASE II	Normal Operating Water Levels with Ice		
	H.W.L.	=	937.0
	T.W.L.	=	-
	Ice El.	=	937.0 (Except Spillway 935.0) (Flashboards removed)
	Uplift included		
CASE III	Horizontal Earthquake Acceleration Under Normal Operating Levels		
	Water Levels same as Case I		
	Uplift included		
CASE IV	Flood Water Levels		
	H.W.L.	=	938.9
	T.W.L.	=	-
	Uplift included		

PRELIMINARY

Note: Uplift, ice and earthquake loadings were applied to the structures in accordance with assumptions detailed on Plate III.

VALUES AND ASSUMPTIONS

STABILITY ANALYSIS

CONCRETE SECTIONS

1. Nomenclature

$\sum H$ = Summation of Horizontal Forces

$\sum V$ = Summation of Vertical Forces

$\sum M_R$ = Summation of Resisting Moment

$\sum M_o$ = Summation of Overturning Moment

$\frac{\sum M_R}{\sum M_o}$ = Factor of Safety Against Overturning

$\frac{\sum H}{\sum V}$ = Coefficient of Sliding

2. Unit weight of concrete - 150 lbs/cu. ft.

3. Unit weight of water - 62.4 lbs/cu. ft.

PRELIMINARY

4. Uplift Pressure: (At Assumed Base)

A. Structures without drains - For all cases considered, the pressure was assumed to vary linearly from full headwater pressure at the upstream side to tailwater pressure at the downstream side taken over 100 percent of the base area.

B. Structures with drains - For all cases considered the pressure was assumed to vary linearly from full headwater pressure at the upstream side to 67 percent full headwater pressure at the drains, and to vary linearly from the drains to tailwater

pressure at the downstream side taken over 100 percent of the base area.

5. Sliding (Shear Included: For discussion and explanation of terms, see Hydroelectric Handbook by Creager and Justin, John Wiley & Sons, Inc., Second Edition - Page 341.)

$$S_{s-f} = \frac{f \Sigma V + r\ Sa\ A}{\Sigma H}$$

Where:

S_{s-f} = Shear Friction Factor of Safety

f = 0.75

r = 0.5

Sa = 380 psi

A = Area of base

PRELIMINARY

6. Ice Load: Horizontal force of 5.0 kips/ft. applied at the Normal Operating Water Level.

7. Earthquake: Acceleration of 0.05g applied in a horizontal direction.

The increase in water pressure, total horizontal force, and overturning moment caused by the earthquake loading was determined from data presented in "Design of Small Dams," USBR, pages 236-238.

STABILITY SUMMARY

SECTION	CONDITION	BASE ELEV.	BASE LENGTH	ΣH (KIPS)	ΣV (KIPS)	$\frac{\Sigma H}{\Sigma V}$	S_{s-f}	RESULTANT FROM DOWNSTREAM	ΣM_R (K-FT)	ΣM_O (K-FT)	$\frac{\Sigma M_R}{\Sigma M_O}$	BASE STRESS (PSI) UPSTREAM	BASE STRESS (PSI) DOWNSTREAM
SPILLWAY SECTION	CASE I	892.25	46.5'	62	87	0.72	21.41	20.65'	4,737	2,945	1.6	9	17
	CASE II	892.25	46.5'	62	90	0.69	21.60	19.92'	4,737	2,949	1.6	8	19
	CASE III	892.25	46.5'	73	87	0.84	18.26	18.62'	4,737	3,119	1.5	5	21
	CASE IV	892.25	46.5'	68	74	0.92	19.47	19.13'	4,737	3,319	1.4	5	17
INTAKE STRUCTURE SECTION	CASE I	887.0	50.5'	5,899	9,276	0.64	23.51	11.28'	486,227	381,596	1.3	-9	36
	CASE II	887.0	50.5'	6,359	9,276	0.69	21.81	8.80'	486,227	404,596	1.2	-13	40
	CASE III	887.0	50.5'	7,016	9,276	0.76	19.21	8.18'	483,211	407,331	1.2	-14	41
	CASE IV	887.0	50.5'	6,485	8,986	0.72	21.36	10.90'	486,227	388,301	1.3	-9	35
GATED SPILLWAY SECTION	CASE I	883.0	45.34'	2,093	2,816	0.74	14.64	13.86'	129,842	90,817	1.4	-3	41
	CASE II	883.0	45.34'	2,208	2,816	0.78	13.88	11.65'	129,842	97,027	1.3	-9	46
	CASE III	883.0	45.34'	2,417	2,816	0.86	12.68	11.58'	129,842	97,238	1.3	-9	46
	CASE IV	883.0	45.34'	2,145	2,688	0.80	14.24	13.86'	129,842	93,352	1.4	-3	39
NON OVERFLOW SECTION	CASE I	897.0	15.0'	19	70	0.27	24.67	3.82'	1,197	929	1.3	-15	80
	CASE II	897.0	15.0'	24	70	0.34	19.48	0.97'	1,197	1,129	1.1	-52	117
	CASE III	897.0	15.0'	27	70	0.38	17.41	1.81'	1,197	1,070	1.1	-41	106
	CASE IV	897.0	15.0'	24	69	0.34	19.42	2.24'	1,197	1,042	1.2	-35	100

NOTES:

1. NEGATIVE BASE STRESS INDICATES TENSION.
2. SECTIONS REFERRED TO ARE ON PLATE I

PRELIMINARY

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE N.Y.
BENNETTS BRIDGE DEVELOPMENT

STABILITY SUMMARY - CONCRETE SECTIONS

UHL, HALL & RICH
DIVISION OF CHAS. T. MAIN
OF NEW YORK INC.

DATE: MARCH 1973
CLIENT JOB
2225 - 213

PLATE 10

CASES USED IN STABILITY ANALYSIS

EARTH SECTIONS

CASE I	Normal Operating Water Levels		
	H.W.L.	=	937.0
	T.W.L.	=	-
CASE II	Horizontal Earthquake Acceleration with Normal Operating Levels		
	H.W.L.	=	937.0
	T.W.L.	=	-
CASE III	Project Flood Water Levels		
	H.W.L.	=	938.9
	T.W.L.	=	-
CASE IV	Rapid Drawdown - Upstream Slope		
	Initial H.W.L.	=	937.0
	Final H.W.L.	=	927.0
	T.W.L.	=	-

Notes:

1. The horizontal earthquake acceleration is applied to entire earth structure outline.
2. Soil Properties for CASES I through IV are found on Plate I and the assumptions used in the analysis are found on Plate VI.

PRELIMINARY

VALUES AND ASSUMPTIONS
STABILITY ANALYSIS
EARTH SECTIONS

1. Soil Properties: The soil properties assumed in the stability analysis are included in the table of soil properties on Plate ~~XXVIII.~~ I

2. Method of Analysis: The analysis of the earth sections was based on the Simplified Bishop Method facilitated by the use of both a computer program developed by UHL, HALL & RICH and the IBM 1130-16K computer system. The Simplified Bishop Method technique was presented in the reference "Stability and Performance of Slopes and Embankments", Soil Mechanics and Foundations Division American Society of Civil Engineers, August 1969, Use of Computers for Slope Stability Analysis by Robert Whitman and William Bailey, pp. 519-548.

From the above indicated reference, the Safety Factor (S.F.) was determined using the following equations:

$$S.F. = \frac{\Sigma(\bar{c}\ \Delta X \sec\Theta + \bar{N}\tan\bar{\phi})}{\Sigma W \sin\Theta}$$

$$\bar{N} = \frac{W - u\cdot\Delta X - \bar{c}\cdot\Delta X \tan\Theta\ /S.F.}{\cos\Theta + \tan\bar{\phi}\ \sin\Theta\ /S.F.}$$

Where:

$\bar{c}$	=	the effective stress cohesion intercept
ΔX	=	width of slice element
$\bar{N}$	=	the effective force acting normal to the failure surface at the bottom of the slice
ΣW	=	resultant of weight of free body
u	=	boundary pore water pressure
Θ	=	the slope of the failure surface at the bottom of slice
$\bar{\phi}$	=	the effective stress friction angle

3. Phreatic Surface: The phreatic surface for the dikes was estimated for steady state seepage by using standard flow net analyses.

4. Earthquake: Acceleration of 0.05g applied in a horizontal direction.

5. Rapid Drawdown: A drawdown of 10 feet was assumed.

PRELIMINARY

SECTIONS	CASE	SAFETY FACTOR	
		UPSTREAM SLOPE	DOWNSTREAM SLOPE
EARTH DIKE	I	1.4	1.1
	II	1.1	0.9
	III	1.0	0.7
	IV	0.9	-

NOTES:

1. REFER TO PLATES V AND VI FOR CASES ANALYZED AND DESIGN ASSUMPTIONS USED.
2. REFER TO PLATE I FOR EARTH SECTION ANALYZED.

PRELIMINARY

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE N.Y.
BENNETTS BRIDGE DEVELOPMENT

STABILITY SUMMARY - EARTH SECTIONS

UHL, HALL & RICH
DIVISION OF CHAS. T. MAIN
OF NEW YORK INC.

DATE: MARCH 1973

CLIENT JOB
2225 - 213

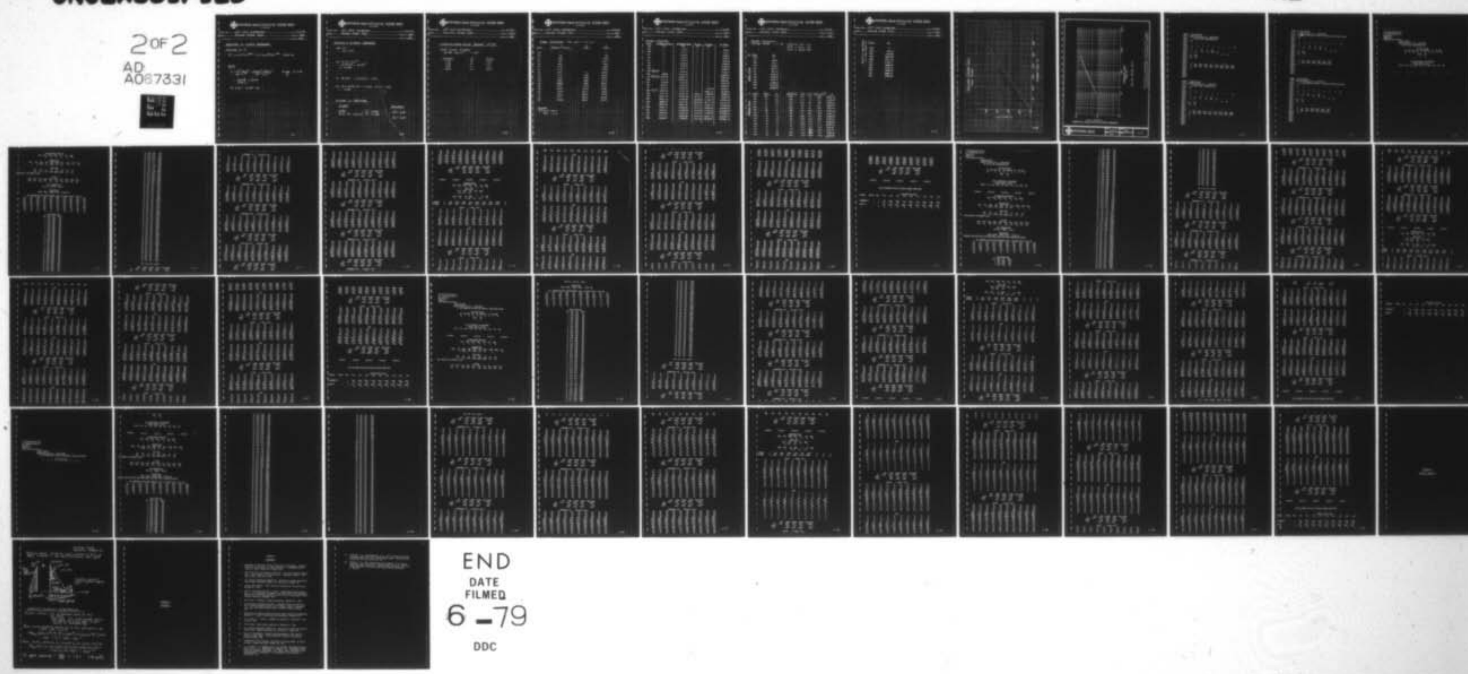
PLATE VII

APPENDIX C

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

AD-A067 331 NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/2
NATIONAL DAM SAFETY PROGRAM. SALMON RIVER RESERVOIR DAM (INVENT--ETC(U)
SEP 78 J B STETSON DACW51-78-C-0035
UNCLASSIFIED NL

2 OF 2
AD
A067331



END
DATE
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6-79
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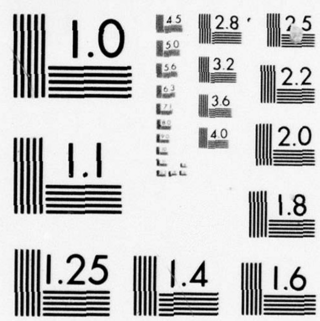

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.14.78

SUBJECT SALMON RIVER DAM PROJECT NO. 2210

DRAWN BY JPG

ESTIMATES OF CLARK'S PARAMETERS

ESTIMATE OF T_C

$$T_C = 11.9\,(L^3/H)^{.385} = (11.9\,(26.97)^3/963)^{.385} = 8.280 \text{ HRS}$$

SCS

$$L = \frac{l^{.8}\,(S+1)^{.7}}{1900\ Y^{.5}} = \frac{(142400)^{.8}\,(3.89+1)^{.7}}{1900\ (6.7)^{.5}} \qquad S = \frac{1000}{CN} - 10 = 3.89$$

$$= \frac{40\,301.78}{4918.03} = 8.200$$

$$T_C = L/.6 = 13.658 \text{ HRS}$$

PROJECT NAME NY DAM INSPECTION DATE 9.15.78
SUBJECT SALMON RIVER DAM PROJECT NO. 2210
DRAWN BY JPG

ESTIMATE OF SNYDER'S PARAMETERS

$640\ C_p =$
$C_p = .625$

$t_p = C_t(L \cdot L_{CA})^{.3} =$
$= 2.0(26.97 \times 10.68)^{.3}$
$= 10.936$

$t_r = t_p/5.5 = 10.936/5.5 = 1.988$

$t_{pr} = t_p + .25(t_R - t_r) = 10.936 + .25(3.0 - 1.988)$
$= 11.189$

SUMMARY OF PARAMETERS

CLARK'S

BPR $T_c = 8.280$
SCS (CN METHOD) $T_c = 13.658$

SNYDER'S

$C_p = .625$

$t_{pr} = 11.189$

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PROJECT NAME NY DAM INSPECTION DATE 9·19·78

SUBJECT SALMON RIVER DAM PROJECT NO. 2210

DRAWN BY JPS

HYDROMETEOROLOGICAL REPORT Nº 33

PMP INDEX RAINFALL

24 HR, 200 MI² - 19.2"

DURATION	%	DEPTH
6 HR	75	14.40"
12 HR	89	17.09"
24 HR	100	19.20"
48 HR	106	20.35"

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TEL 315•797•5800

PROJECT NAME NY DAM INSPECTION DATE 9.18.78

SUBJECT SALMON RIVER DAM PROJECT NO. 2210

DRAWN BY JPG

STAGE - DISCHARGE (FROM CREST OF SPILLWAY)

ELEV	Q PRINCIPAL SPILLWAY	Q DAM	Q TOTAL
935	—		—
936	781.		781
937	2208		2208
938	4057		4057
939	6246		6246
940	8730		8730
941	11475		11475
942	14460	—	14460
943	17667	1248	18915
944	21082	3530	24612
945	24691	6485	31176
946	28486	9984	38470
947	32417	13953	46410
948	36597	18342	54939
949	40400	23113	63513
950	45360	28239	73599
951	49971	33696	83667
952	54728	39465	94193

LENGTH

SPILLWAY - 500.0'

DAM - 115.0'

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PROJECT NAME NY DAM INSPECTION DATE 9.18.78

SUBJECT SALMON RIVER DAM PROJECT NO. 2210

DRAWN BY JPG

STAGE - DISCHARGE

ELEV	Q PRINC. SPILLWAY (244)	Q TAINTER GATES (220)	Q DAM (142)	Q DIKES (1500)	Q TOTAL
926	—	—	—	—	—
927	—	704.00	—	—	704.00
928	—	1991.21	—	—	1991.21
929	—	3658.09	—	—	3658.09
930	—	5632.00	—	—	5632.00
931	—	7870.96	—	—	7870.96
932	—	10346.64	—	—	10346.64
933	—	13038.26	—	—	13038.26
934	—	15929.70	—	—	15929.70
935 (CREST OF SPILLWAY)	—	19008.00	—	—	19008.00
• 936	780.80	22262.43	—	—	23043.23
937 (TOP OF FLASHBOARDS)	2208.44	25683.94	—	—	27892.38
938	4057.16	28906.00	—	—	32963.16
• 939	6246.40	31566.90	—	—	37813.30
940	8729.61	33913.60	—	—	42643.21
941	11475.37	36219.70	—	3750.00	51445.07
• 942 (TOP OF DAM)	14460.62	37911.70	—	10606.61	62978.93
943	17667.49	40720.00	355.00	19485.57	78228.06
944	21081.60	43519.63	1004.09	30000.00	95605.32
• 945	24691.06	47051.48	1849.63	41926.27	115513.44
946	28485.83	50177.60	2840.00	55113.52	136616.96
947	32457.25	53431.59	3969.02	69450.97	159308.83
• 948	36597.79	56870.52	5217.41	84852.81	183538.53
949	40400.81	60398.94	6574.69	101250.00	208624.44
950	45360.38	63766.68	8032.73	118585.41	235745.20
951	49971.20	68476.80	9585.00	136810.77	264843.77
• 952	54728.45	72546.93	11226.08	155884.57	294386.03

PROJECT NAME NY DAM INSPECTION — DATE 9·18·78

SUBJECT SALMON RIVER DAM — PROJECT NO. 2210

DRAWN BY JPG

STAGE DISCHARGE

TAINTER GATES - 11 x 20'

a) SPILLWAY CREST - 926'

b) TOP OF GATES - 935'

c) TOP OF BRIDGE - 942'

a) WEIR FLOW

ELEV	Q
926	—
927	704.00
928	1991.21
929	3658.09
930	5632.00
931	7870.96
932	10346.64
933	13038.26
934	15929.70
935	19008.00
936	22262.43
937	25683.94

b) ORIFICE FLOW

ELEV	d/H_1	C	$2/3\sqrt{2g}\ CL$	$H_1^{3/2}$	$H_2^{3/2}$	$(H_1^{3/2} - H_2^{3/2})^{3/2}$	Q
938	.80	.63	745	41.6	2.8	38.8	28906.00
939	.77	.64	757	46.9	5.2	41.7	31566.90
940	.71	.64	757	52.8	8.0	44.8	33913.60
941	.67	.65	769	58.3	11.2	47.1	36219.90
942	.62	.65	769	64.0	14.7	49.3	37911.70
943	.58	.66	780	70.0	18.5	51.5	40170.00
944	.55	.66	780	76.4	22.6	53.8	41964.00
945	.53	.67	792	82.8	27.0	55.8	44193.60
946	.50	.67	792	89.4	31.6	57.8	45777.60
947	.48	.67	792	96.2	36.5	59.7	47282.40
948	.45	.67	792	103.2	41.6	61.6	48787.20
949	.43	.67	792	110.3	46.9	63.4	50212.80
950	.42	.67	792	117.6	52.8	64.8	51321.60
951	.40	.68	804	125.0	58.3	66.7	53626.80
952	.38	.68	804	132.6	64.0	68.6	55154.40

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PROJECT NAME NY DAM INSPECTION DATE 9.18.78

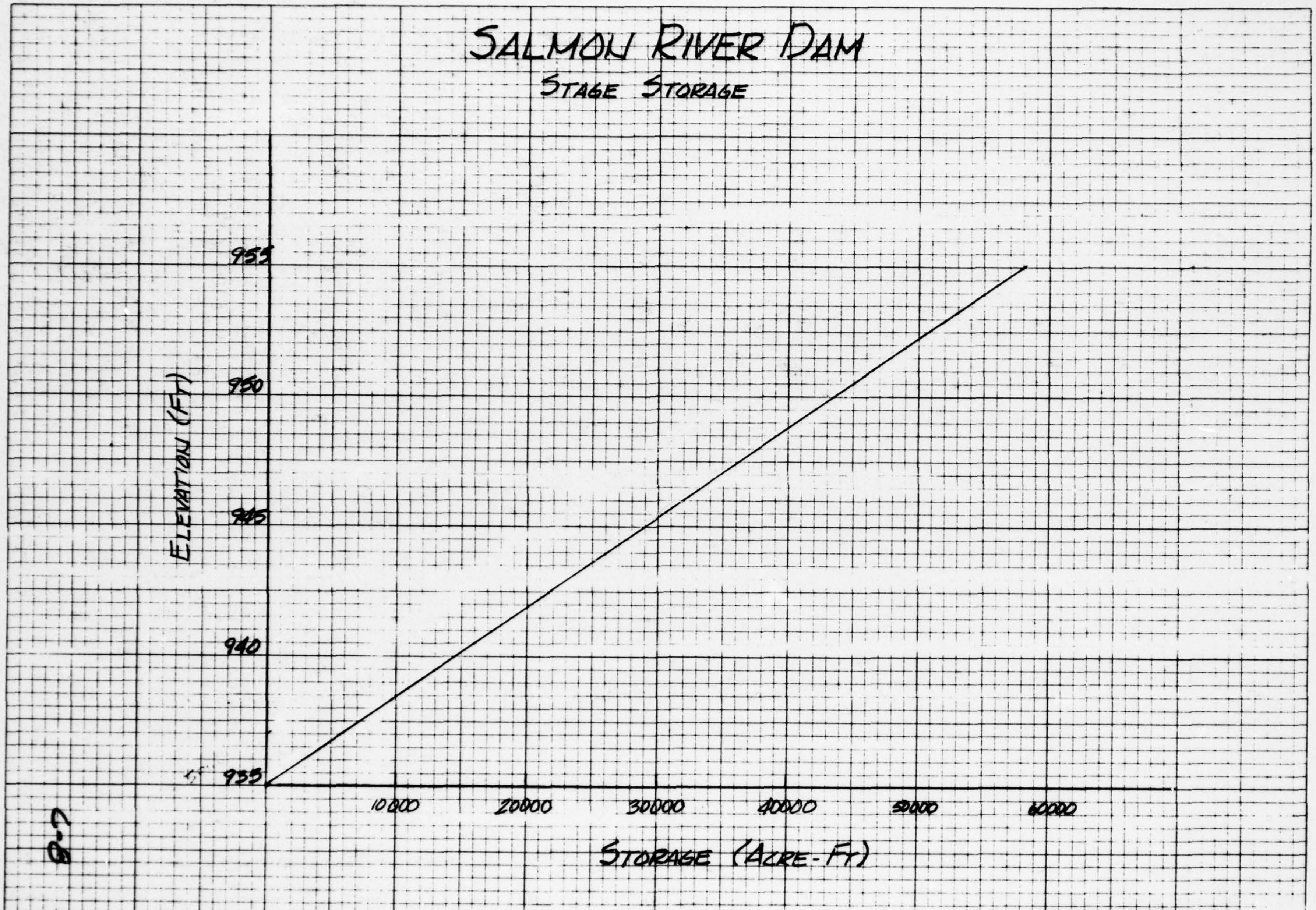
SUBJECT SALMON RIVER DAM PROJECT NO. 2210

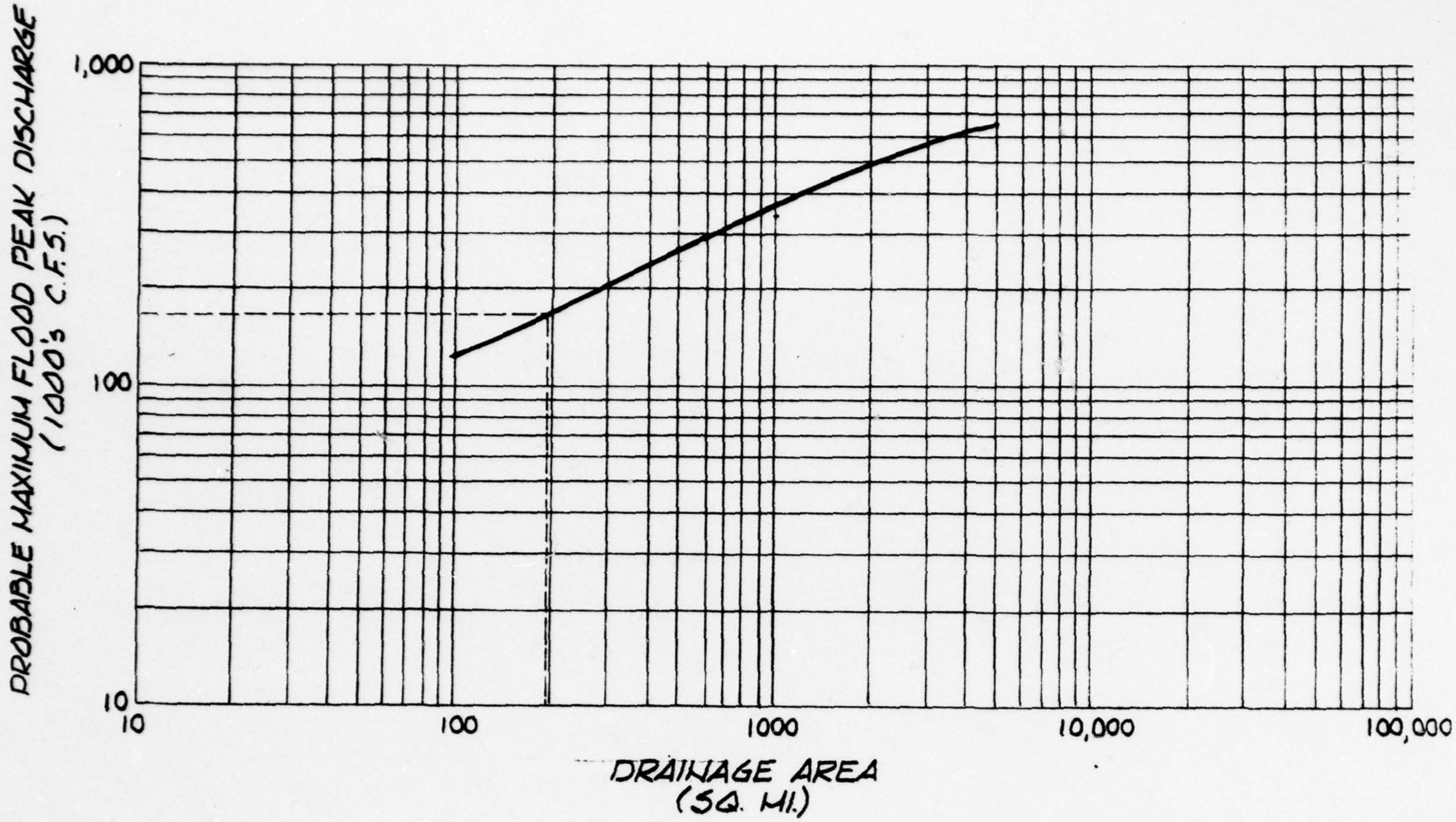
DRAWN BY JPG

WEIR FLOW OVER BRIDGE (IN PLACE OF DAM)

c)

ELEV	Q
942	—
943	550.00
944	1555.63
945	2857.88
946	4400.00
947	6149.19
948	8083.32
949	10186.14
950	12445.08
951	14850.00
952	17392.53


SALMON RIVER DAM
STAGE STORAGE
ELEVATION (FT)
955
950
945
940
935
10000
20000
30000
40000
50000
60000
STORAGE (ACRE-FT)



SALMON RIVER DAM

ESTIMATE OF PROBABLE MAXIMUM FLOOD USING
NUCLEAR REGULATORY COMMISSION CURVES

STETSON • DALE	DATE 9.15.78	DRAWN JPG	C-9
	JOB 2210	APP'D	

```
00100 A    SALMON RIVER DAM
0110 A   RESERVOIR ROUTING OF P.M.F. - SNYDER METHOD
0120 A         244 FOOT SPILLWAY (UNCONTROLLED ONLY)
0130 B     90       1
0140 1     5
0150 J     1       9       1
00160 1    .1      .2      .3      .4      .5      .6      .7      .8     1.0
0170 K     0       1
0180 M     1       1      193      0      193                              1
0190 P     0     19.2      75      89     100     106
0200 T                                                    1.0     0.1
0210 W   11.2    0.625
0220 X    390     390      1
0230 K     1       1
0240 Y                             1       1
00250 1     1                                                  -1
0260 2     0     5528   11056   16584   22112   27640   33168   38696   46988
0270 3     0     2208   36246   11475   18915   31170   46410   63513   94193
0280 K    99
0290 A
0300 A
0310 A
0320 A
0330 A
```

```
00100 A    SALMON RIVER DAM
0110 A   RESERVOIR ROUTING OF P.M.F. - CLARK METHOD
0120 A         244 FOOT SPILLWAY (UNCONTROLLED ONLY)
0130 B     90       1
0140 1     5
0150 J     1       9       1
00160 1    .1      .2      .3      .4      .5      .6      .7      .8     1.0
0170 K     0       1
0180 M     1       0      193      0      193                              1
0190 P     0     19.2      75      89     100     106
0200 T                                                    1.0     0.1
0210 V   13.7    13.7
0220 X    390     390      1
0230 K     1       1
0240 Y                             1       1
00250 1     1                                                  -1
0260 2     0     5528   11056   16584   22112   27640   33168   38696   46988
0270 3     0     2208   36246   11475   18915   31170   46410   63513   94193
0280 K    99
0290 A
0300 A
0310 A
0320 A
0330 A
```

C-10

```
00100 A    SALMON RIVER DAM
0110 A   RESERVOIR ROUTING OF P.M.F. - SNYDER METHOD
0120 A    244[redacted]FOOT UNCONTROLLED SPILLWAY PLUS CONTROLLED TAINTER GATED SPILLWAY
0130 B    150      1
0140 1      5
0150 J      1      9      1
0160 1     .1     .2     .3     .4     .5     .6     .7     .8    1.0
0170 K      0      1
0180 M      1      1    193      0    193                              1
0190 P      0   19.2     75     89    100    106
0200 T                                              1.0    0.1
0210 V   11.2  0.625
0220 X    390    390      1
0230 K      1      1
0240 Y                           1      1
0250 1      1                                        -1
0260 2      0   2764  11056  19348  27640  35932  46988
0270 3      0  23043  37813  62979 115513 183538 294386
00280 K    99
0290 A
0300 A
0310 A
0320 A
0330 A
```

```
00100 A    SALMON RIVER DAM
0110 A   RESERVOIR ROUTING OF P.M.F. - CLARK METHOD
0120 A        244 FOOT UNCONTROLLED SPILLWAY PLUS CONTROLLED TAINTER GATED SPILLWAY
0130 B     90      1
0140 1      5
0150 J      1      9      1
0160 1     .1     .2     .3     .4     .5     .6     .7     .8    1.0
0170 K      0      1
0180 M      1      0    193      0    193                              1
0190 P      0   19.2     75     89    100    106
0200 T                                              1.0    0.1
0210 V   13.7   13.7
0220 X    390    390      1
0230 K      1      1
0240 Y                           1      1
0250 1      1                                        -1
0260 2      0   7464  15756  24048  32340  40632  51688
0270 3      0  23043  37813  62979 115513 183538 294386
00280 K    99
0290 A
0300 A
0310 A
0320 A
0330 A
```

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..............................

******************************
EC-1 VERSION DATED JAN 1973
PDATED AUG 74
CHANGE NO. Ø1
******************************
                    SALMON RIVER DAM
                   RESERVOIR ROUTING OF P.M.F. - CLARK METHOD
                      244 FOOT SPILLWAY (UNCONTROLLED ONLY)

                                         JOB SPECIFICATION
                         NQ   NHR  NMIN  IDAY   IHR  IMIN METRC  IPLT  IPRT NSTAN
                         9Ø     1     Ø     Ø     Ø     Ø     Ø     Ø     Ø     Ø
                                         JOPER    NWT
                                             5      Ø


                              MULTI-PLAN ANALYSES TO BE PERFORMED
                                 NPLAN# 1 NRTIO# 9 LRTIO# 1
                   RTIOS#   Ø.1Ø   Ø.2Ø   Ø.3Ø   Ø.4Ø   Ø.5Ø   Ø.6Ø   Ø.7Ø   Ø.8Ø   1.ØØ


          ..........          ..........          ..........          ..........          ..........
```

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	0	193.00	0.0	193.00	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	19.20	75.00	89.00	100.00	106.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.882

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.10	0.0	0.0

UNIT HYDROGRAPH DATA

TC= 13.70 R= 13.70 NTA= 0

RECESSION DATA

STRTQ= 390.00 QRCSN= 390.00 RTIOR= 1.00

UNIT HYDROGRAPH 80 END-OF-PERIOD ORDINATES, LAG= 12.56 HOURS, CP= 0.57 VOL= 1.00

122.	459.	940.	1506.	2131.	2800.	3499.	4176.	4756.	5215.
5551.	5759.	5824.	5685.	5356.	4979.	4628.	4303.	4000.	3718.
3456.	3213.	2986.	2776.	2581.	2399.	2230.	2073.	1927.	1791.
1665.	1548.	1439.	1337.	1243.	1156.	1074.	999.	928.	863.
802.	746.	693.	644.	599.	557.	518.	481.	447.	416.
386.	359.	334.	310.	289.	268.	249.	232.	215.	200.
186.	173.	161.	150.	139.	129.	120.	112.	104.	97.
90.	83.	78.	72.	67.	62.	58.	54.	50.	46.

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.01	0.00	390.
2	0.01	0.00	390.
3	0.01	0.00	390.
4	0.01	0.00	390.
5	0.01	0.00	390.
6	0.01	0.00	390.
7	0.02	0.00	390.
8	0.02	0.00	390.
9	0.02	0.00	390.
10	0.02	0.00	390.
11	0.02	0.00	390.
12	0.02	0.00	390.
13	0.08	0.00	390.
14	0.09	0.00	390.
15	0.11	0.00	390.
16	0.29	0.00	390.
17	0.11	0.00	390.
18	0.08	0.00	390.
19	0.01	0.00	390.
20	0.01	0.00	390.
21	0.01	0.00	390.
22	0.01	0.00	390.
23	0.01	0.00	390.
24	0.01	0.00	390.
25	0.12	0.02	393.
26	0.12	0.02	404.
27	0.12	0.02	427.
28	0.12	0.02	463.
29	0.12	0.02	514.
30	0.12	0.02	5[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
32	0.39	0.29	925.
33	0.39	0.29	1294.
34	0.39	0.29	1828.
35	0.39	0.29	2539.
36	0.39	0.29	3436.
37	1.27	1.17	4632.
38	1.52	1.42	6333.
39	1.90	1.80	8735.
40	4.82	4.72	12355.
41	1.78	1.68	17544.
42	1.40	1.30	24069.
43	0.19	0.09	31537.
44	0.19	0.09	39494.
45	0.19	0.09	47551.
46	0.19	0.09	55388.
47	0.19	0.09	62589.
48	0.19	0.09	68696.
49	0.0	0.0	73411.
50	0.0	0.0	76533.
51	0.0	0.0	77949.
52	0.0	0.0	77652.
53	0.0	0.0	75619.
54	0.0	0.0	72137.
55	0.0	0.0	67932.
56	0.0	0.0	63588.
57	0.0	0.0	59388.
58	0.0	0.0	55416.
59	0.0	0.0	51662.
60	0.0	0.0	48122.
61	0.0	0.0	44790.
62	0.0	0.0	41669.
63	0.0	0.0	38762.
64	0.0	0.0	36060.
65	0.0	0.0	33548.
66	0.0	0.0	31213.
67	0.0	0.0	29042.
68	0.0	0.0	27025.
69	0.0	0.0	25149.
70	0.0	0.0	23405.
71	0.0	0.0	21785.
72	0.0	0.0	20278.
73	0.0	0.0	18877.
74	0.0	0.0	17575.
75	0.0	0.0	16365.
76	0.0	0.0	15240.
77	0.0	0.0	14194.
78	0.0	0.0	13222.
79	0.0	0.0	12319.
80	0.0	0.0	11478.
81	0.0	0.0	10698.
82	0.0	0.0	9972.
83	0.0	0.0	9297.
84	0.0	0.0	8670.
85	0.0	0.0	8087.
86	0.0	0.0	7545.
87	0.0	0.0	7041.
88	0.0	0.0	6572.
89	0.0	0.0	6137.
90	0.0	0.0	5732.
SUM	17.89	14.49	1772944.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	77949.	75550.	55446.	24526.	1772927.
INCHES		[illegible]	[illegible]	[illegible]	[illegible]

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	40.	43.	46.	51.	58.
70.	92.	129.	183.	254.	344.	463.	633.	874.	1236.
1754.	2407.	3154.	3949.	4755.	5539.	6259.	6870.	7341.	7653.
7795.	7765.	7562.	7214.	6793.	6359.	5939.	5542.	5166.	4812.
4479.	4167.	3876.	3606.	3355.	3121.	2904.	2702.	2515.	2341.
2178.	2028.	1888.	1758.	1637.	1524.	1419.	1322.	1232.	1148.
1070.	997.	930.	867.	809.	754.	704.	657.	614.	573.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7795.	7555.	5545.	2453.	177293.
INCHES		0.36	1.07	1.42	1.42
AC-FT		3748.	11003.	14602.	14660.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	79.	81.	85.	93.	103.	116.
140.	185.	259.	366.	508.	687.	926.	1267.	1747.	2471.
3509.	4814.	6307.	7899.	9510.	11078.	12518.	13739.	14682.	15307.
15590.	15530.	15124.	14427.	13586.	12718.	11878.	11083.	10332.	9624.
8958.	8334.	7752.	7212.	6710.	6243.	5808.	5405.	5030.	4681.
4357.	4056.	3775.	3515.	3273.	3048.	2839.	2644.	2464.	2296.
2140.	1994.	1859.	1734.	1617.	1509.	1408.	1314.	1227.	1146.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	15590.	15110.	11089.	4905.	354587.
INCHES		0.73	2.14	2.84	2.85
AC-FT		7496.	22006.	29204.	29320.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	118.	121.	128.	139.	154.	175.
210.	277.	388.	548.	762.	1031.	1389.	1900.	2621.	3707.
5263.	7221.	9461.	11848.	14265.	16616.	18777.	20609.	22023.	22960.
23385.	23296.	22686.	21641.	20379.	19076.	17816.	16625.	15499.	14437.
13437.	12501.	11629.	10818.	10064.	9364.	8713.	8107.	7545.	7022.
6535.	6083.	5663.	5273.	4910.	4572.	4258.	3967.	3696.	3444.
3209.	2992.	2789.	2601.	2426.	2263.	2112.	1972.	1841.	1720.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23385.	22665.	16634.	7358.	531881.
INCHES		1.09	3.21	4.26	4.27
AC-FT		11245.	33010.	43806.	43980.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	157.	162.	171.	185.	206.	233.
280.	370.	518.	731.	1016.	1375.	1853.	2533.	3494.	4942.
7018.	9628.	12615.	15798.	19021.	22155.	25036.	27478.	29364.	30613.
31179.	31061.	30247.	28855.	27173.	25435.	23755.	22166.	20665.	19249.
17916.	16668.	15505.	14424.	13419.	12485.	11617.	10810.	10060.	9362.
8714.	8111.	7551.	7030.	6546.	6096.	5678.	5289.	4927.	4591.
4279.	3989.	3719.	3468.	3235.	3018.	2816.	2629.	2455.	2293.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	31179.	30220.	22178.	9811.	709175.
INCHES		1.46	4.28	5.67	5.70
AC-FT		14993.	44013.	58408.	58640.

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	196.	202.	213.	232.	257.	291.
350.	462.	647.	914.	1270.	1718.	2316.	3166.	4368.	6178.
8772.	12035.	15768.	19747.	23776.	27694.	31294.	34348.	36705.	38267.
38974.	38826.	37809.	36068.	33966.	31794.	29694.	27708.	25831.	24061.
22395.	20835.	19381.	18030.	16774.	15606.	14521.	13512.	12574.	11703.
10892.	10139.	9439.	8788.	8183.	7620.	7097.	6611.	6159.	5739.
5349.	4986.	4648.	4335.	4043.	3772.	3520.	3286.	3068.	2866.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	38974.	37775.	27723.	12263.	886469.
INCHES		1.82	5.34	7.09	7.12
AC-FT		18741.	55016.	73009.	73300.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	236.	242.	256.	278.	309.	349.
420.	555.	776.	1097.	1523.	2062.	2779.	3799.	5241.	7413.
10526.	14442.	18922.	23697.	28531.	33233.	37553.	41218.	44046.	45920.
46769.	46591.	45371.	43282.	40759.	38153.	35633.	33249.	30997.	28873.
26874.	25002.	23257.	21636.	20129.	18728.	17425.	16215.	15089.	14043.
13071.	12167.	11326.	10545.	9819.	9144.	8517.	7933.	7391.	6887.
6419.	5983.	5578.	5202.	4852.	4527.	4224.	3943.	3682.	3439.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	46769.	45330.	33268.	14716.	1063761.
INCHES		2.18	6.41	8.51	8.55
AC-FT		22489.	66019.	87611.	87959.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	275.	283.	299.	324.	360.	407.
490.	647.	906.	1279.	1777.	2405.	3242.	4433.	6115.	8649.
12281.	16849.	22076.	27646.	33286.	38772.	43812.	48087.	51387.	53573.
54564.	54357.	52933.	50496.	47552.	44511.	41572.	38791.	36164.	33685.
31353.	29168.	27134.	25242.	23484.	21849.	20330.	18917.	17604.	16384.
15249.	14194.	13214.	12303.	11456.	10668.	9936.	9256.	8623.	8035.
7488.	6980.	6508.	6069.	5661.	5281.	4928.	4601.	4296.	4013.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	54564.	52885.	38812.	17168.	1241044.
INCHES		2.55	7.48	9.93	9.97
AC-FT		26237.	77022.	102212.	102619.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	314.	323.	341.	370.	412.	466.
560.	740.	1035.	1462.	2031.	2749.	3705.	5066.	6988.	9884.
14035.	19255.	25229.	31595.	38041.	44310.	50071.	54957.	58728.	61227.
62359.	62122.	60495.	57709.	54345.	50870.	47510.	44332.	41330.	38497.
35832.	33335.	31010.	28848.	26838.	24970.	23234.	21620.	20119.	18724.
17428.	16222.	15102.	14060.	13092.	12192.	11355.	10578.	9855.	9183.
8558.	7977.	7438.	6936.	6469.	6036.	5633.	5258.	4910.	4586.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	62359.	60440.	44357.	19621.	1418336.
INCHES		2.91	8.55	11.35	11.39
AC-FT		29986.	88025.	116814.	117278.

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HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	393.	404.	427.	463.	514.	582.
700.	925.	1294.	1828.	2539.	3436.	4632.	6332.	8735.	12355.
17544.	24069.	31537.	39494.	47551.	55388.	62589.	68696.	73410.	76533.
77948.	77652.	75618.	72136.	67931.	63588.	59388.	55416.	51662.	48122.
44790.	41669.	38762.	36060.	33548.	31213.	29042.	27024.	25149.	23405.
21784.	20278.	18877.	17575.	16365.	15240.	14194.	13222.	12318.	11478.
10698.	9972.	9297.	8670.	8087.	7545.	7041.	6572.	6137.	5732.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	77948.	75550.	55446.	24526.	1772921.
INCHES		3.64	10.69	14.19	14.24
AC-FT		37482.	110031.	146017.	146598.

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HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	1

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE=	0.	5528.	11056.	16584.	22112.	27640.	33168.	38696.	46988.	0.
OUTFLOW=	0.	2208.	36246.	11475.	18915.	31170.	46410.	63513.	94193.	0.

STATION 1, PLAN 1, RTIO 1

39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	40.	40.
41.	42.	44.	48.	54.	62.	73.	88.	110.	140.
184.	246.	328.	433.	560.	709.	878.	1062.	1259.	1461.
1665.	1863.	2052.	2418.	4278.	5210.	5591.	5651.	5531.	5311.
5041.	4750.	4454.	4165.	3887.	3624.	3376.	3144.	2927.	2724.
2536.	2360.	2207.	2195.	2178.	2159.	2137.	2112.	2085.	2056.
2025.	1993.	1959.	1925.	1890.	1854.	1817.	1780.	1743.	1706.

STOR

98.	98.	98.	98.	98.	98.	98.	98.	98.	98.
98.	98.	98.	98.	98.	98.	98.	98.	98.	98.
98.	98.	98.	98.	98.	98.	98.	98.	99.	100.
102.	106.	111.	120.	134.	154.	182.	221.	275.	351.
462.	616.	822.	1084.	1403.	1775.	2197.	2660.	3151.	3658.
4167.	4665.	5136.	5562.	5864.	6016.	6077.	6087.	6068.	6032.
5988.	5941.	5893.	5846.	5801.	5758.	5718.	5680.	5645.	5612.
5581.	5553.	5526.	5495.	5454.	5405.	5350.	5287.	5219.	5147.
5070.	4989.	4905.	4819.	4731.	4641.	4549.	4457.	4364.	4270.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5651.	5389.	3661.	1759.	127369.
INCHES		0.26	0.71	1.02	1.02
AC-FT		2674.	7264.	10474.	10532.

STATION 1, PLAN 1, RTIO 2

78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	79.	79.	80.
82.	84.	89.	96.	107.	123.	145.	176.	219.	281.
369.	492.	656.	866.	1120.	1418.	1755.	2125.	6070.	9690.
12026.	13460.	14217.	14444.	14266.	13814.	13199.	12502.	11774.	11046.

2485.	2315.	2204.	2191.	2174.	2154.	2132.	2107.	2079.	2050.

STOR

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	196.	197.	198.	201.
205.	211.	222.	241.	268.	308.	364.	441.	549.	703.
923.	1231.	1644.	2168.	2805.	3551.	4395.	5319.	6155.	6743.
7122.	7355.	7478.	7515.	7486.	7413.	7313.	7200.	7082.	6963.
6848.	6736.	6631.	6531.	6437.	6350.	6268.	6192.	6121.	6055.
5993.	5936.	5883.	5834.	5788.	5745.	5706.	5669.	5634.	5603.
5573.	5545.	5518.	5485.	5443.	5393.	5337.	5274.	5206.	5134.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	14444.	13900.	9713.	4082.	295284.
INCHES		0.67	1.87	2.36	2.37
AC-FT		6896.	19274.	24300.	24416.

STATION 1, PLAN 1, RTIO 3

117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	118.	119.	120.
123.	127.	133.	144.	161.	185.	218.	264.	329.	421.
553.	738.	985.	1299.	1681.	2127.	7517.	12456.	16050.	18663.
20492.	21648.	22192.	22181.	21706.	20903.	19907.	18817.	17699.	16591.
15514.	14482.	13501.	12577.	11711.	10901.	10145.	9441.	8786.	8176.
7609.	7082.	6592.	6136.	5712.	5318.	4952.	4611.	4295.	4001.
3727.	3473.	3236.	3017.	2813.	2623.	2446.	2282.	2202.	2188.

STOR

293.	293.	293.	293.	293.	293.	293.	293.	293.	293.
293.	293.	293.	293.	293.	293.	293.	293.	293.	293.
293.	293.	293.	293.	293.	293.	294.	295.	297.	301.
307.	317.	334.	361.	402.	462.	546.	662.	824.	1054.
1385.	1847.	2465.	3252.	4208.	5326.	6390.	7192.	7776.	8200.
8497.	8685.	8774.	8772.	8695.	8564.	8402.	8225.	8044.	7864.
7689.	7521.	7362.	7212.	7071.	6940.	6817.	6703.	6596.	6497.
6405.	6320.	6240.	6166.	6097.	6033.	5974.	5918.	5867.	5819.
5775.	5733.	5695.	5659.	5626.	5595.	5567.	5540.	5512.	5478.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	22192.	21520.	15506.	6490.	469373.
INCHES		1.04	2.99	3.75	3.77
AC-FT		10677.	30772.	38637.	38811.

STATION 1, PLAN 1, RTIO 4

156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	157.	158.	160.
163.	169.	178.	192.	214.	246.	291.	352.	439.	561.
737.	984.	1313.	1732.	2617.	9907.	15460.	19840.	23321.	26026.
28002.	29267.	29829.	29716.	29026.	27922.	26572.	25107.	23610.	22128.
20689.	19311.	18003.	16770.	15615.	14535.	13527.	12588.	11715.	10902.
10146.	9443.	8789.	8181.	7616.	7091.	6602.	6148.	5726.	5334.
4969.	4630.	4315.	4022.	3750.	3497.	3262.	3043.	2840.	2651.

STOR

391.	391.	391.	391.	391.	391.	391.	391.	391.	391.
391.	391.	391.	391.	391.	391.	391.	391.	391.	391.
391.	391.	391.	391.	391.	391.	392.	393.	397.	402.
409.	422.	445.	481.	537.	616.	727.	882.	1098.	1406.
1846.	2463.	3287.	4335.	5594.	6778.	7680.	8392.	8957.	9396.
9717.	9922.	10014.	9996.	9883.	9704.	9485.	9247.	9004.	8763.
8530.	8306.	8093.	7893.	7705.	7530.	7366.	7214.	7072.	6940.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	29829.	28960.	21228.	8938.	646318.
INCHES		1.40	4.09	5.17	5.19
AC-FT		14368.	42127.	53210.	53442.

STATION 1, PLAN 1, RTIO 5

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	196.	196.	198.	200.
204.	211.	222.	240.	268.	308.	363.	440.	548.	702.
922.	1230.	1641.	2165.	9615.	16154.	21566.	26132.	29943.	33003.
35282.	35682.	34484.	33368.	32619.	32501.	33299.	35389.	33514.	30039.
27276.	24979.	23003.	21260.	19695.	18273.	16971.	15773.	14665.	13640.
12690.	11808.	10989.	10228.	9521.	8864.	8253.	7686.	7158.	6668.
6212.	5788.	5394.	5028.	4688.	4371.	4077.	3804.	3550.	3313.

STOR

488.	488.	488.	488.	488.	488.	488.	488.	488.	488.
488.	488.	488.	488.	488.	488.	488.	488.	488.	488.
488.	488.	488.	488.	488.	489.	490.	492.	496.	502.
512.	528.	556.	601.	671.	770.	909.	1103.	1373.	1757.
2308.	3079.	4109.	5419.	6731.	7793.	8672.	9413.	10032.	10529.
10899.	11182.	11449.	11698.	11865.	11892.	11714.	11247.	10612.	10048.
9599.	9226.	8905.	8622.	8368.	8137.	7926.	7731.	7551.	7385.
7230.	7087.	6954.	6830.	6716.	6609.	6510.	6418.	6332.	6252.
6178.	6109.	6045.	5986.	5931.	5879.	5832.	5787.	5746.	5708.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	35682.	34073.	26869.	11389.	823536.
INCHES		1.64	5.18	6.59	6.62
AC-FT		16904.	53322.	67806.	68096.

STATION 1, PLAN 1, RTIO 6

234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	235.	236.	238.	241.
245.	253.	266.	288.	321.	369.	436.	528.	658.	842.
1106.	1476.	1969.	7073.	14797.	21322.	27030.	32042.	36143.	32125.
25663.	16111.	13548.	16791.	19766.	23071.	25391.	26910.	27785.	28146.
28100.	27737.	27131.	26345.	25428.	24421.	23356.	22259.	21150.	20045.
18956.	18273.	17585.	16885.	16178.	15473.	14773.	14083.	13406.	12746.
12104.	11482.	14036.	17966.	23847.	32553.	28111.	18364.	12461.	8851.

STOR

586.	586.	586.	586.	586.	586.	586.	586.	586.	586.
586.	586.	586.	586.	586.	586.	586.	586.	586.	586.
586.	586.	586.	586.	586.	586.	588.	590.	595.	602.
614.	634.	667.	722.	805.	924.	1091.	1323.	1648.	2109.
2769.	3694.	4931.	6318.	7573.	8632.	9559.	10373.	11079.	11976.
13418.	15549.	18124.	20534.	22496.	23987.	25033.	25718.	26113.	26276.
26255.	26091.	25818.	25464.	25050.	24596.	24115.	23621.	23120.	22622.
22131.	21635.	21124.	20603.	20079.	19554.	19034.	18522.	18019.	17528.
17051.	16589.	16012.	15135.	13823.	11880.	9735.	8152.	7193.	6607.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	36143.	29054.	24907.	13742.	993612.
INCHES		1.40	4.80	7.95	7.98
AC-FT		14414.	49428.	81811.	82159.

STATION 1, PLAN 1, RTIO 7

273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	274.	275.	277.	281.

14394.	18615.	24317.	28915.	32535.	35296.	36880.	37555.	37539.	37005.
36087.	34895.	33516.	32017.	30580.	29252.	27882.	26496.	25114.	23751.
22419.	21127.	19881.	18771.	18045.	17309.	16571.	15836.	15109.	14395.
13696.	13015.	12354.	11715.	13099.	16566.	21774.	29505.	32098.	20762.

STOR

683.	683.	683.	683.	683.	683.	683.	683.	683.	683.
683.	683.	683.	683.	683.	683.	683.	683.	683.	683.
683.	683.	683.	683.	684.	684.	685.	689.	694.	703.
716.	739.	778.	842.	939.	1078.	1273.	1544.	1922.	2460.
3231.	4310.	5710.	7129.	8341.	9428.	10421.	11459.	13011.	15545.
18753.	21889.	24549.	26623.	28135.	29137.	29711.	29956.	29950.	29756.
29424.	28991.	28491.	27947.	27374.	26775.	26157.	25532.	24908.	24293.
23693.	23110.	22548.	22005.	21465.	20919.	20370.	19824.	19284.	18753.
18234.	17728.	17237.	16762.	16222.	15448.	14286.	12560.	10382.	8541.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	37555.	36727.	29813.	15964.	1154346.
INCHES		1.77	5.75	9.23	9.27
AC-FT		18221.	59163.	95043.	95450.

STATION 1, PLAN 1, RTIO 8

312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	313.	314.	317.	321.
327.	337.	355.	384.	429.	492.	581.	705.	877.	1123.
1475.	1968.	7428.	15941.	23598.	30729.	34946.	26961.	13380.	15943.
21877.	28651.	34780.	39755.	43083.	45031.	45882.	45890.	45264.	44170.
42737.	41069.	39250.	37343.	35400.	33458.	31544.	29947.	28423.	26912.
25429.	23985.	22588.	21244.	19957.	18798.	18058.	17311.	16563.	15821.
15089.	14370.	13668.	12985.	12323.	11683.	13235.	16775.	22088.	29969.

STOR

781.	781.	781.	781.	781.	781.	781.	781.	781.	781.
781.	781.	781.	781.	781.	781.	781.	781.	781.	781.
781.	781.	781.	781.	781.	782.	783.	787.	793.	803.
819.	845.	890.	962.	1073.	1232.	1455.	1764.	2197.	2811.
3692.	4926.	6376.	7758.	9002.	10160.	11346.	13128.	16159.	19904.
23448.	26504.	28949.	30754.	31961.	32668.	32976.	32979.	32752.	32355.
31836.	31231.	30571.	29879.	29174.	28470.	27776.	27088.	26401.	25719.
25050.	24399.	23769.	23163.	22582.	22025.	21475.	20920.	20365.	19813.
19269.	18735.	18213.	17706.	17214.	16739.	16191.	15401.	14215.	12457.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	45890.	44887.	34813.	17835.	1289758.
INCHES		2.16	6.71	10.32	10.36
AC-FT		22269.	69086.	106182.	106647.

STATION 1, PLAN 1, RTIO 9

390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	391.	393.	396.	401.
409.	422.	444.	480.	536.	615.	726.	881.	1097.	1404.
1844.	5348.	14457.	23000.	31325.	32604.	20613.	14101.	20806.	29897.
39303.	47260.	53920.	58444.	61072.	62134.	61988.	60948.	59268.	57143.
54720.	52115.	49417.	46695.	44235.	41810.	39421.	37092.	34841.	32680.
30716.	29091.	27494.	25939.	24433.	22985.	21597.	20273.	19014.	18227.
17475.	16723.	15976.	15239.	14516.	13810.	13123.	12458.	11815.	12683.

STOR

976.	976.	976.	976.	976.	976.	976.	976.	976.	976.
976.	976.	976.	976.	976.	976.	976.	976.	976.	976.
976.	976.	976.	976.	977.	977.	979.	984.	991.	1004.
1023.	1056.	1112.	1203.	1341.	1541.	1819.	2205.	2746.	3514.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30590.	33443.	35595.	37058.	37907.	38250.	38203.	37867.	37324.	36637.
35854.	35012.	34140.	33260.	32379.	31500.	30633.	29788.	28971.	28188.
27435.	26702.	25982.	25280.	24601.	23948.	23322.	22725.	22157.	21601.
21042.	20483.	19928.	19381.	18843.	18319.	17809.	17314.	16836.	16314.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	62134.	60642.	46321.	21997.	1590804.
INCHES		2.92	8.93	12.72	12.78
AC-FT		30086.	91923.	130959.	131539.

********** ********** ********** ********** **********

PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

			RATIOS APPLIED TO FLOWS								
PERATION	STATION	PLAN	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00
HYDROGRAPH AT	1	1	7795.	15590.	23385.	31179.	38974.	46769.	54564.	62359.	77948.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
OUTED TO	1	1	5651.	14444.	22192.	29829.	35682.	36143.	37555.	45890.	62134.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.

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****************************
EC-1 VERSION DATED JAN 1973
PDATED AUG 74
HANGE NO. 01
****************************
                    SALMON RIVER DAM
                    RESERVOIR ROUTING OF P.M.F. - SNYDER METHOD
                       244 FOOT SPILLWAY (UNCONTROLLED ONLY)

                                    JOB SPECIFICATION
                         NQ   NHR  NMIN  IDAY   IHR  IMIN METRC  IPLT  IPRT NSTAN
                         90     1     0     0     0     0     0     0     0     0
                                     JOPER   NWT
                                         5     0

                              MULTI-PLAN ANALYSES TO BE PERFORMED
                                 NPLAN= 1 NRTIO= 9 LRTIO= 1
                    RTIOS=  0.10   0.20   0.30   0.40   0.50   0.60   0.70   0.80   1.00

          **********           **********           **********           **********           **********

                              SUB-AREA RUNOFF COMPUTATION
                         ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME
                             1       0       0       0       0       0       0

                                    HYDROGRAPH DATA
                  IHYDG   IUHG  TAREA   SNAP  TRSDA  TRSPC  RATIO  ISNOW  ISAME  LOCAL
                      1      1 193.00    0.0 193.00    0.0    0.0      0      1      0

                                      PRECIP DATA
                      SPFE    PMS     R6     R12    R24    R48    R72    R96
                       0.0  19.20  75.00  89.00 100.00 106.00    0.0    0.0
RSPC COMPUTED BY THE PROGRAM IS 0.882

                                       LOSS DATA
                STRKR  DLTKR  RTIOL  ERAIN  STRKS  RTIOK  STRTL  CNSTL  ALSMX  RTIMP
                  0.0    0.0   1.00    0.0    0.0   1.00   1.00   0.10    0.0    0.0

                                  UNIT HYDROGRAPH DATA
                              TP= 11.20    CP=0.63    NTA=  0

                                     RECESSION DATA
                         STRTQ=  390.00    QRCSN=  390.00    RTIOR= 1.00
PPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=12.21 AND R=10.25 INTERVALS

                UNIT HYDROGRAPH 61 END-OF-PERIOD ORDINATES, LAG=  11.10 HOURS, CP= 0.63  VOL= 1.00
            192.     716.    1454.    2311.    3243.    4226.    5194.    6022.    6640.    7049.
           7242.    7182.    6770.    6160.    5587.    5067.    4596.    4169.    3781.    3430.
           3111.    2821.    2559.    2321.    2105.    1910.    1732.    1571.    1425.    1292.
           1172.    1063.     964.     875.     793.     720.     653.     592.     537.     487.
            442.     401.     363.     330.     299.     271.     246.     223.     202.     184.
            166.     151.     137.     124.     113.     102.      93.      84.      76.      69.
             63.

                                   END-OF-PERIOD FLOW
                              TIME  RAIN  EXCS     COMP Q
                                 1  0.01  0.00       390.
                                 2  0.01  0.00       390.
                                 3  0.01  0.00       390.
```

5	0.01	0.00	390.
6	0.01	0.00	390.
7	0.02	0.00	390.
8	0.02	0.00	390.
9	0.02	0.00	390.
10	0.02	0.00	390.
11	0.02	0.00	390.
12	0.02	0.00	390.
13	0.08	0.00	390.
14	0.09	0.00	390.
15	0.11	0.00	390.
16	0.29	0.00	390.
17	0.11	0.00	390.
18	0.08	0.00	390.
19	0.01	0.00	390.
20	0.01	0.00	390.
21	0.01	0.00	390.
22	0.01	0.00	390.
23	0.01	0.00	390.
24	0.01	0.00	390.
25	0.12	0.02	395.
26	0.12	0.02	412.
27	0.12	0.02	447.
28	0.12	0.02	503.
29	0.12	0.02	581.
30	0.12	0.02	683.
31	0.39	0.29	860.
32	0.39	0.29	1200.
33	0.39	0.29	1754.
34	0.39	0.29	2550.
35	0.39	0.29	3603.
36	0.39	0.29	4920.
37	1.27	1.17	6658.
38	1.52	1.42	9113.
39	1.90	1.80	12573.
40	4.82	4.72	17827.
41	1.78	1.68	25383.
42	1.40	1.30	34819.
43	0.19	0.09	45405.
44	0.19	0.09	56360.
45	0.19	0.09	67079.
46	0.19	0.09	76922.
47	0.19	0.09	85104.
48	0.19	0.09	91041.
49	0.0	0.0	94376.
50	0.0	0.0	94981.
51	0.0	0.0	92951.
52	0.0	0.0	88348.
53	0.0	0.0	82087.
54	0.0	0.0	75401.
55	0.0	0.0	68902.
56	0.0	0.0	62871.
57	0.0	0.0	57300.
58	0.0	0.0	52158.
59	0.0	0.0	47420.
60	0.0	0.0	43071.
61	0.0	0.0	39104.
62	0.0	0.0	35504.
63	0.0	0.0	32239.
64	0.0	0.0	29278.
65	0.0	0.0	26592.
66	0.0	0.0	24155.
67	0.0	0.0	21945.
68	0.0	0.0	19941.
69	0.0	0.0	18123.

71	0.0	0.0	14979.
72	0.0	0.0	13622.
73	0.0	0.0	12392.
74	0.0	0.0	11276.
75	0.0	0.0	10264.
76	0.0	0.0	9345.
77	0.0	0.0	8513.
78	0.0	0.0	7757.
79	0.0	0.0	7072.
80	0.0	0.0	6451.
81	0.0	0.0	5887.
82	0.0	0.0	5376.
83	0.0	0.0	4913.
84	0.0	0.0	4492.
85	0.0	0.0	4111.
86	0.0	0.0	3763.
87	0.0	0.0	3448.
88	0.0	0.0	3163.
89	0.0	0.0	2903.
90	0.0	0.0	2668.
SUM	17.89	14.49	1821168.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	94981.	91133.	61638.	25196.	1821153.
INCHES		4.39	11.88	14.57	14.63
AC-FT		45213.	122319.	150006.	150586.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	41.	45.	50.	58.	68.
86.	120.	175.	255.	360.	492.	666.	911.	1257.	1783.
2538.	3482.	4541.	5636.	6708.	7692.	8510.	9104.	9438.	9498.
9295.	8835.	8209.	7540.	6890.	6287.	5730.	5216.	4742.	4307.
3910.	3550.	3224.	2928.	2659.	2416.	2195.	1994.	1812.	1647.
1498.	1362.	1239.	1128.	1026.	935.	851.	776.	707.	645.
589.	538.	491.	449.	411.	376.	345.	316.	290.	267.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9498.	9113.	6164.	2520.	182115.
INCHES		0.44	1.19	1.46	1.46
AC-FT		4521.	12232.	15001.	15059.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	79.	82.	89.	101.	116.	137.
172.	246.	351.	510.	721.	984.	1332.	1823.	2515.	3565.
5077.	6964.	9081.	11272.	13416.	15384.	17021.	18208.	18875.	18996.
18590.	17670.	16417.	15080.	13780.	12574.	11460.	10432.	9484.	8614.
7821.	7101.	6448.	5856.	5318.	4831.	4389.	3988.	3625.	3295.
2996.	2724.	2478.	2255.	2053.	1869.	1703.	1551.	1414.	1290.
1177.	1075.	983.	898.	822.	753.	690.	633.	581.	534.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	18996.	18227.	12328.	5039.	364232.
INCHES		0.88	2.38	2.91	2.93
AC-FT		9043.	24464.	30001.	30117.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	118.	124.	134.	151.	174.	205.
258.	360.	526.	765.	1081.	1476.	1997.	2734.	3772.	5348.

27885.	26504.	24626.	22620.	20671.	18861.	17190.	15647.	14226.	12921.
11731.	10651.	9672.	8783.	7977.	7247.	6584.	5982.	5437.	4942.
4494.	4087.	3718.	3383.	3079.	2804.	2554.	2327.	2122.	1935.
1766.	1613.	1474.	1348.	1233.	1129.	1034.	949.	871.	800.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	28494.	27340.	18491.	7559.	546348.
INCHES		1.32	3.57	4.37	4.39
AC-FT		13564.	36696.	45002.	45176.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	158.	165.	179.	201.	232.	273.
344.	480.	701.	1020.	1441.	1968.	2663.	3645.	5029.	7131.
10153.	13928.	18162.	22544.	26831.	30769.	34042.	36416.	37750.	37993.
37180.	35339.	32835.	30160.	27561.	25148.	22920.	20863.	18968.	17228.
15642.	14202.	12896.	11711.	10637.	9662.	8778.	7976.	7249.	6590.
5991.	5449.	4957.	4510.	4105.	3738.	3405.	3103.	2829.	2580.
2355.	2150.	1965.	1797.	1644.	1505.	1379.	1265.	1161.	1067.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	37993.	36453.	24655.	10079.	728464.
INCHES		1.76	4.75	5.83	5.85
AC-FT		18085.	48928.	60003.	60235.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	197.	206.	224.	251.	291.	341.
430.	600.	877.	1275.	1801.	2460.	3329.	4556.	6286.	8913.
12692.	17409.	22703.	28180.	33539.	38461.	42552.	45520.	47188.	47491.
46476.	44174.	41043.	37701.	34451.	31436.	28650.	26079.	23710.	21535.
19552.	17752.	16120.	14639.	13296.	12078.	10973.	9971.	9062.	8237.
7489.	6811.	6196.	5638.	5132.	4673.	4256.	3879.	3536.	3225.
2944.	2688.	2456.	2246.	2055.	1882.	1724.	1581.	1452.	1334.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	47491.	45567.	30819.	12598.	910580.
INCHES		2.20	5.94	7.29	7.31
AC-FT		22607.	61160.	75003.	75293.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	237.	247.	268.	302.	349.	410.
516.	720.	1052.	1530.	2162.	2952.	3995.	5468.	7543.	10696.
15230.	20891.	27243.	33816.	40247.	46153.	51062.	54625.	56625.	56989.
55771.	53008.	49252.	45241.	41341.	37723.	34380.	31294.	28452.	25843.
23462.	21302.	19343.	17567.	15955.	14493.	13167.	11965.	10874.	9885.
8987.	8173.	7435.	6765.	6158.	5607.	5108.	4654.	4243.	3871.
3532.	3226.	2948.	2695.	2466.	2258.	2069.	1898.	1742.	1601.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	56989.	54680.	36983.	15118.	1092688.
INCHES		2.64	7.13	8.74	8.78
AC-FT		27128.	73392.	90003.	90351.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	276.	288.	313.	352.	407.	478.
602.	840.	1228.	1785.	2522.	3444.	4661.	6379.	8801.	12479.
17768.	24373.	31784.	39452.	46955.	53845.	59573.	63729.	66063.	66487.
65066.	61843.	57461.	52781.	48231.	44010.	40110.	36510.	33194.	30150.

10485.	9535.	8674.	7893.	7184.	6542.	5959.	5430.	4951.	4516.
4121.	3763.	3439.	3144.	2877.	2634.	2414.	2214.	2032.	1868.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	66487.	63793.	43146.	17637.	1274798.
INCHES		3.07	8.32	10.20	10.24
AC-FT		31649.	85624.	105003.	105410.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	316.	330.	358.	402.	465.	546.
688.	960.	1403.	2040.	2882.	3936.	5326.	7290.	10058.	14261.
20306.	27855.	36324.	45088.	53663.	61537.	68083.	72833.	75500.	75985.
74361.	70678.	65669.	60321.	55121.	50297.	45840.	41726.	37936.	34457.
31283.	28403.	25791.	23422.	21273.	19324.	17556.	15953.	14498.	13179.
11983.	10898.	9913.	9021.	8211.	7476.	6810.	6206.	5658.	5161.
4710.	4301.	3930.	3594.	3289.	3011.	2759.	2530.	2323.	2135.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	75985.	72907.	49310.	20157.	1456912.
INCHES		3.51	9.51	11.66	11.70
AC-FT		36171.	97855.	120004.	120468.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	395.	412.	447.	503.	581.	683.
860.	1200.	1754.	2550.	3603.	4920.	6658.	9113.	12572.	17827.
25383.	34819.	45405.	56360.	67079.	76922.	85104.	91041.	94375.	94981.
92951.	88347.	82087.	75401.	68902.	62871.	57299.	52157.	47420.	43071.
39104.	35504.	32239.	29278.	26591.	24155.	21945.	19941.	18123.	16474.
14979.	13622.	12392.	11276.	10263.	9345.	8513.	7757.	7072.	6451.
5887.	5376.	4913.	4492.	4111.	3763.	3448.	3163.	2903.	2668.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	94981.	91133.	61637.	25196.	1821145.
INCHES		4.39	11.88	14.57	14.63
AC-FT		45213.	122319.	150005.	150585.

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HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	1

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE#	0.	5528.	11056.	16584.	22112.	27640.	33168.	38696.	46988.	0.
OUTFLOW#	0.	2208.	36246.	11475.	18915.	31170.	46410.	63513.	94193.	0.

STATION 1, PLAN 1, RTIO 1

39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	40.	41.
42.	44.	47.	53.	61.	73.	89.	112.	144.	188.
252.	342.	461.	611.	792.	1000.	1231.	1477.	1730.	1981.
2380.	5092.	6483.	7048.	7116.	6902.	6539.	6107.	5649.	5193.
4753.	4338.	3952.	3597	3271.	2973.	2702.	2456.	2231.	2194.

1829.	1788.	1746.	1705.	1663.	1622.	1581.	1541.	1500.	1461.

STOR

98.	98.	98.	98.	98.	98.	98.	98.	98.	98.
98.	98.	98.	98.	98.	98.	98.	98.	98.	98.
98.	98.	98.	98.	98.	98.	98.	99.	100.	102.
105.	110.	118.	132.	153.	182.	223.	280.	359.	471.
632.	856.	1154.	1530.	1982.	2503.	3081.	3697.	4331.	4960.
5556.	5996.	6222.	6314.	6325.	6290.	6231.	6161.	6087.	6013.
5941.	5874.	5811.	5754.	5701.	5652.	5608.	5568.	5532.	5492.
5441.	5381.	5312.	5236.	5153.	5066.	4974.	4878.	4780.	4680.
4578.	4475.	4372.	4268.	4164.	4061.	3959.	3857.	3756.	3657.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7116.	6699.	4146.	1930.	139643.
INCHES		0.32	0.80	1.12	1.12
AC-FT		3324.	8228.	11489.	11547.

STATION 1, PLAN 1, RTIO 2

78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	79.	80.	81.
84.	88.	94.	105.	122.	146.	178.	224.	287.	376.
505.	684.	922.	1223.	1534.	2000.	5370.	10337.	13665.	15803.
17016.	17468.	17296.	16668.	15760.	14713.	13619.	12535.	11489.	10499.
9574.	8717.	7929.	7208.	6550.	5952.	5407.	4913.	4464.	4057.
3687.	3351.	3047.	2771.	2521.	2294.	2198.	2180.	2157.	2131.
2102.	2070.	2036.	2001.	1964.	1926.	1886.	1847.	1806.	1766.

STOR

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	196.	196.	198.	200.	204.
210.	220.	236.	264.	305.	365.	447.	561.	719.	943.
1263.	1712.	2308.	3061.	3965.	5007.	6041.	6848.	7389.	7736.
7933.	8006.	7978.	7876.	7729.	7559.	7381.	7205.	7035.	6875.
6724.	6585.	6457.	6340.	6233.	6136.	6048.	5967.	5894.	5828.
5768.	5714.	5664.	5619.	5579.	5542.	5504.	5457.	5401.	5335.
5262.	5183.	5098.	5009.	4917.	4821.	4723.	4623.	4523.	4421.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	17468.	16669.	10709.	4338.	313715.
INCHES		0.80	2.06	2.51	2.52
AC-FT		8270.	21251.	25824.	25940.

STATION 1, PLAN 1, RTIO 3

117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	118.	118.	120.	122.
126.	132.	142.	158.	183.	218.	268.	336.	431.	565.
757.	1026.	1383.	1834.	4301.	11318.	16586.	20576.	23511.	25496.
26589.	26835.	26320.	25226.	23773.	22148.	20476.	18830.	17250.	15759.
14366.	13078.	11895.	10813.	9826.	8928.	8111.	7370.	6696.	6085.
5530.	5027.	4571.	4157.	3781.	3440.	3131.	2851.	2597.	2366.
2204.	2187.	2166.	2142.	2114.	2084.	2051.	2017.	1981.	1944.

STOR

293.	293.	293.	293.	293.	293.	293.	293.	293.	293.
293.	293.	293.	293.	293.	293.	293.	293.	293.	293.
293.	293.	293.	293.	293.	293.	294.	296.	300.	306.
314.	329.	355.	396.	458.	547.	670.	841.	1078.	1414.
1895.	2567.	3462.	4591.	5868.	7008.	7863.	8511.	8988.	9310.
9488.	9528.	9444.	9266.	9030.	8766.	8495.	8227.	7971.	7729.
7503.	7293.	7101.	6925.	6765.	6619.	6487.	6366.	6257.	6158.
6068.	5986.	5912.	5844.	5783.	5728.	5678.	5632.	5591.	5554.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	26835.	25706.	17157.	6798.	491578.
INCHES		1.24	3.31	3.93	3.95
AC-FT		12753.	34048.	40473.	40647.

STATION 1, PLAN 1, RTIO 4

156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	157.	158.	160.	163.
167.	175.	189.	211.	244.	291.	357.	448.	574.	753.
1009.	1367.	1844.	5169.	13087.	19461.	24712.	28978.	32266.	34540.
35776.	35972.	35207.	33702.	31738.	29554.	27315.	25115.	23006.	21015.
19157.	17439.	15861.	14418.	13102.	11904.	10815.	9826.	8928.	8113.
7374.	6703.	6094.	5542.	5042.	4587.	4175.	3802.	3463.	3155.
2876.	2623.	2394.	2206.	2190.	2170.	2147.	2120.	2091.	2059.

STOR

391.	391.	391.	391.	391.	391.	391.	391.	391.	391.
391.	391.	391.	391.	391.	391.	391.	391.	391.	391.
391.	391.	391.	391.	391.	391.	392.	395.	400.	407.
419.	439.	473.	528.	610.	729.	894.	1121.	1437.	1885.
2526.	3423.	4617.	6009.	7295.	8330.	9183.	9876.	10410.	10779.
10980.	11011.	10887.	10643.	10324.	9969.	9606.	9248.	8906.	8582.
8281.	8002.	7745.	7511.	7297.	7103.	6926.	6765.	6619.	6487.
6367.	6258.	6159.	6070.	5988.	5914.	5847.	5787.	5732.	5682.
5637.	5595.	5558.	5524.	5484.	5434.	5375.	5308.	5234.	5155.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	35972.	34577.	23499.	9285.	671312.
INCHES		1.67	4.53	5.37	5.39
AC-FT		17155.	46633.	55277.	55509.

STATION 1, PLAN 1, RTIO 5

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	196.	197.	200.	203.
209.	219.	236.	263.	305.	364.	446.	560.	718.	941.
1261.	1709.	3419.	12353.	19860.	26407.	32127.	35448.	30492.	22835.
11860.	14912.	17830.	20803.	23366.	24973.	25824.	26083.	25883.	25336.
24532.	23545.	22436.	21251.	20029.	18841.	18070.	17269.	16452.	15630.
14812.	14004.	13214.	12445.	11701.	13590.	17737.	23950.	33150.	26934.
17259.	11400.	7819.	5601.	4201.	3295.	2690.	2269.	2188.	2163.

STOR

488.	488.	488.	488.	488.	488.	488.	488.	488.	488.
488.	488.	488.	488.	488.	488.	488.	488.	488.	488.
488.	488.	488.	488.	488.	489.	490.	494.	500.	509.
524.	549.	591.	659.	763.	911.	1117.	1401.	1797.	2356.
3158.	4279.	5725.	7176.	8395.	9458.	10387.	11234.	12340.	14049.
16498.	19138.	21306.	22963.	24120.	24845.	25229.	25345.	25255.	25008.
24646.	24200.	23700.	23166.	22614.	22057.	21484.	20889.	20282.	19671.
19063.	18463.	17876.	17305.	16752.	16112.	15187.	13800.	11747.	9544.
7972.	7021.	6439.	6079.	5852.	5705.	5606.	5538.	5479.	5414.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	35448.	27862.	22917.	11776.	851385.
INCHES		1.34	4.42	6.81	6.84
AC-FT		13823.	45479.	70108.	70399.

STATION 1, PLAN 1, RTIO 6

234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	235.	237.	240.	244.
251.	263.	283.	316.	366.	437.	535.	672.	861.	1129.

21991.	27429.	31459.	34688.	36448.	37078.	36868.	36044.	34782.	33220.
31468.	29889.	28284.	26634.	24977.	23340.	21744.	20203.	18798.	17911.
17018.	16129.	15252.	14393.	13557.	12749.	11970.	12563.	16251.	21792.
30015.	31003.	19678.	12840.	8678.	6116.	4513.	3487.	2810.	2348.

STOR

586.	586.	586.	586.	586.	586.	586.	586.	586.	586.
586.	586.	586.	586.	586.	586.	586.	586.	586.	586.
586.	586.	586.	586.	586.	587.	588.	593.	600.	611.
629.	659.	709.	791.	916.	1094.	1341.	1682.	2156.	2828.
3790.	5135.	6660.	8067.	9331.	10489.	11791.	13808.	16924.	20437.
23500.	25952.	27745.	28916.	29554.	29783.	29707.	29408.	28950.	28384.
27748.	27062.	26338.	25594.	24846.	24108.	23388.	22693.	22025.	21366.
20703.	20042.	19390.	18752.	18131.	17530.	16952.	16341.	15518.	14282.
12447.	10204.	8365.	7255.	6579.	6163.	5902.	5736.	5626.	5551.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	37078.	35984.	28349.	14289.	1032991.
INCHES		1.73	5.47	8.26	8.30
AC-FT		17853.	56259.	85067.	85415.

STATION 1, PLAN 1, RTIO 7

273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	274.	276.	279.	285.
293.	307.	331.	369.	427.	510.	625.	784.	1005.	1318.
1766.	4517.	14075.	22814.	31085.	33250.	22588.	13015.	18481.	26246.
33255.	39432.	43567.	45931.	46916.	46736.	45747.	44226.	42309.	40133.
37807.	35415.	33021.	30760.	28880.	27013.	25188.	23421.	21726.	20112.
18707.	17791.	16875.	15970.	15082.	14216.	13376.	12567.	11790.	13325.
17418.	23543.	32606.	27604.	17627.	11595.	7915.	5643.	4215.	3296.

STOR

683.	683.	683.	683.	683.	683.	683.	683.	683.	683.
683.	683.	683.	683.	683.	683.	683.	683.	683.	683.
683.	683.	683.	683.	684.	684.	687.	691.	700.	713.
734.	768.	828.	923.	1068.	1276.	1564.	1962.	2515.	3299.
4421.	5903.	7455.	8875.	10218.	11725.	14104.	17728.	21790.	25419.
28396.	30637.	32137.	32994.	33331.	33273.	32928.	32376.	31680.	30891.
30047.	29180.	28311.	27455.	26607.	25765.	24941.	24144.	23380.	22652.
21957.	21277.	20597.	19924.	19264.	18620.	17997.	17395.	16818.	16171.
15258.	13891.	11868.	9652.	8032.	7052.	6455.	6086.	5854.	5705.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	46916.	45520.	33934.	16803.	1214760.
INCHES		2.19	6.54	9.72	9.76
AC-FT		22584.	67342.	100039.	100445.

STATION 1, PLAN 1, RTIO 8

312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	313.	316.	319.	325.
335.	351.	378.	421.	488.	583.	714.	896.	1148.	1506.
2018.	8787.	18240.	27353.	36200.	26474.	12037.	18193.	27159.	36219.
44187.	50369.	54405.	56353.	56663.	55767.	54021.	51700.	49009.	46134.
43421.	40644.	37873.	35160.	32539.	30239.	28259.	26328.	24464.	22681.
20986.	19384.	18263.	17336.	16417.	15514.	14632.	13776.	12949.	12155.
11823.	15149.	20164.	27619.	34138.	21567.	13989.	9387.	6563.	4805.

STOR

781.	781.	781.	781.	781.	781.	781.	781.	781.	781.
781.	781.	781.	781.	781.	781.	781.	781.	781.	781.
781.	781.	781.	781.	781.	782.	785.	790.	800.	815.
839.	878.	946.	1055.	1221.	1458.	1788.	2242.	2875.	3770.
5053.	6596.	8132.	9612.	11066.	13237.	17001.	21575.	25831.	29471.

32362.	34448.	35752.	36382.	36482.	36192.	35628.	34878.	34008.	33068.
32084.	31076.	30071.	29087.	28137.	27220.	26327.	25456.	24615.	23811.
23046.	22323.	21628.	20939.	20256.	19585.	18930.	18294.	17680.	17089.
16506.	15764.	14645.	12981.	10714.	8672.	7441.	6694.	6235.	5950.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	56663.	54818.	39599.	19307.	1395708.
INCHES		2.64	7.63	11.17	11.21
AC-FT		27197.	78584.	114943.	115407.

STATION 1, PLAN 1, RTIO 9

390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	392.	394.	399.	407.
419.	439.	472.	527.	610.	728.	892.	1120.	1435.	1882.
6140.	15860.	25698.	35914.	24890.	13329.	21377.	32877.	45115.	56211.
64984.	71791.	75352.	76252.	75164.	72703.	69357.	65477.	61635.	57919.
54103.	50295.	46572.	43321.	40174.	37147.	34263.	31539.	29374.	27347.
25396.	23534.	21767.	20100.	18676.	17741.	16812.	15898.	15004.	14136.
13296.	12489.	11715.	13628.	17866.	24197.	33556.	26376.	16907.	11178.

STOR

976.	976.	976.	976.	976.	976.	976.	976.	976.	976.
976.	976.	976.	976.	976.	976.	976.	976.	976.	976.
976.	976.	976.	976.	977.	978.	981.	988.	1000.	1018.
1048.	1098.	1182.	1319.	1526.	1823.	2234.	2803.	3593.	4713.
6167.	7745.	9343.	11002.	13590.	17961.	23223.	28259.	32698.	36336.
39094.	40933.	41896.	42139.	41845.	41180.	40275.	39227.	38089.	36888.
35655.	34424.	33220.	32048.	30906.	29808.	28762.	27774.	26830.	25915.
25036.	24196.	23399.	22646.	21934.	21240.	20550.	19870.	19206.	18561.
17937.	17337.	16762.	16104.	15158.	13745.	11656.	9453.	7915.	6985.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	76252.	73436.	51848.	24245.	1752694.
INCHES		3.54	10.00	14.02	14.08
AC-FT		36434.	102893.	144345.	144925.

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PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

			RATIOS APPLIED TO FLOWS								
PERATION	STATION	PLAN	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00
HYDROGRAPH AT	1	1	9498.	18996.	28494.	37993.	47491.	56989.	66487.	75985.	94981.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
OUTED TO	1	1	7116.	17468.	26835.	35972.	35448.	37078.	46916.	56663.	76252.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.

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HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01
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SALMON RIVER DAM
RESERVOIR ROUTING OF P.M.F. - CLARK METHOD
244 FOOT UNCONTROLLED SPILLWAY PLUS CONTROLLED TAINTER GATED SPILLWAY

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
90	1	0	0	0	0	0	0	0	0

JOPER	NWT
5	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1
RTIOS= 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 1.00

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SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	0	193.00	0.0	193.00	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	19.20	75.00	89.00	100.00	106.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.882

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.10	0.0	0.0

TC# 13.70 R# 13.70 NTA# 0

RECESSION DATA

STRTQ# 390.00 QRCSN# 390.00 RTIOR# 1.00

UNIT HYDROGRAPH 80 END-OF-PERIOD ORDINATES, LAG# 12.56 HOURS, CP# 0.57 VOL# 1.00

122.	459.	940.	1506.	2131.	2800.	3499.	4176.	4756.	5215.
5551.	5759.	5824.	5685.	5356.	4979.	4628.	4303.	4009.	3718.
3456.	3213.	2986.	2776.	2581.	2399.	2230.	2073.	1927.	1791.
1665.	1548.	1439.	1337.	1243.	1156.	1074.	999.	928.	863.
802.	746.	693.	644.	599.	557.	518.	481.	447.	416.
386.	359.	334.	310.	289.	268.	249.	232.	215.	200.
186.	173.	161.	150.	139.	129.	120.	112.	104.	97.
90.	83.	78.	72.	67.	62.	58.	54.	50.	46.

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.01	0.00	390.
2	0.01	0.00	390.
3	0.01	0.00	390.
4	0.01	0.00	390.
5	0.01	0.00	390.
6	0.01	0.00	390.
7	0.02	0.00	390.
8	0.02	0.00	390.
9	0.02	0.00	390.
10	0.02	0.00	390.
11	0.02	0.00	390.
12	0.02	0.00	390.
13	0.08	0.00	390.
14	0.09	0.00	390.
15	0.11	0.00	390.
16	0.29	0.00	390.
17	0.11	0.00	390.
18	0.08	0.00	390.
19	0.01	0.00	390.
20	0.01	0.00	390.
21	0.01	0.00	390.
22	0.01	0.00	390.
23	0.01	0.00	390.
24	0.01	0.00	390.
25	0.12	0.02	393.
26	0.12	0.02	404.
27	0.12	0.02	427.
28	0.12	0.02	463.
29	0.12	0.02	514.
30	0.12	0.02	582.
31	0.39	0.29	700.
32	0.39	0.29	925.
33	0.39	0.29	1294.
34	0.39	0.29	1828.
35	0.39	0.29	2539.
36	0.39	0.29	3436.
37	1.27	1.17	4632.
38	1.52	1.42	6333.
39	1.90	1.80	8735.
40	4.82	4.72	12355.
41	1.78	1.68	17544.
42	1.40	1.30	24069.
43	0.19	0.09	31537.
44	0.19	0.09	39494.
45	0.19	0.09	47551.
46	0.19	0.09	55388.
47	0.19	0.09	62589.
48	0.19	0.09	68696.

50	0.0	0.0	76533.
51	0.0	0.0	77949.
52	0.0	0.0	77652.
53	0.0	0.0	75619.
54	0.0	0.0	72137.
55	0.0	0.0	67932.
56	0.0	0.0	63588.
57	0.0	0.0	59388.
58	0.0	0.0	55416.
59	0.0	0.0	51662.
60	0.0	0.0	48122.
61	0.0	0.0	44790.
62	0.0	0.0	41669.
63	0.0	0.0	38762.
64	0.0	0.0	36060.
65	0.0	0.0	33548.
66	0.0	0.0	31213.
67	0.0	0.0	29042.
68	0.0	0.0	27025.
69	0.0	0.0	25149.
70	0.0	0.0	23405.
71	0.0	0.0	21785.
72	0.0	0.0	20278.
73	0.0	0.0	18877.
74	0.0	0.0	17575.
75	0.0	0.0	16365.
76	0.0	0.0	15240.
77	0.0	0.0	14194.
78	0.0	0.0	13222.
79	0.0	0.0	12319.
80	0.0	0.0	11478.
81	0.0	0.0	10698.
82	0.0	0.0	9972.
83	0.0	0.0	9297.
84	0.0	0.0	8670.
85	0.0	0.0	8087.
86	0.0	0.0	7545.
87	0.0	0.0	7041.
88	0.0	0.0	6572.
89	0.0	0.0	6137.
90	0.0	0.0	5732.
SUM	17.89	14.49	1772944.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	77949.	75550.	55446.	24526.	1772927.
INCHES		3.64	10.69	14.19	14.24
AC-FT		37482.	110032.	146018.	146598.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	40.	43.	46.	51.	58.
70.	92.	129.	183.	254.	344.	463.	633.	874.	1236.
1754.	2407.	3154.	3949.	4755.	5539.	6259.	6870.	734[illegible].	7653.
7795.	7765.	7562.	7214.	6793.	6359.	5939.	5542.	5166.	4812.
4479.	4167.	3876.	3606.	3355.	3121.	2904.	2702.	2515.	2341.
2178.	2028.	1888.	1758.	1637.	1524.	1419.	1322.	1232.	1148.
1070.	997.	930.	867.	809.	754.	704.	657.	614.	573.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7795.	7555.	5545.	2453.	177293.
INCHES		0.36	1.07	1.42	1.42
AC-FT		3748.	11003.	14602.	14660.

78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	79.	81.	85.	93.	103.	116.
140.	185.	259.	366.	508.	687.	926.	1267.	1747.	2471.
3509.	4814.	6307.	7899.	9510.	11078.	12518.	13739.	14682.	15307.
15590.	15530.	15124.	14427.	13586.	12718.	11878.	11083.	10332.	9624.
8958.	8334.	7752.	7212.	6710.	6243.	5808.	5405.	5030.	4681.
4357.	4056.	3775.	3515.	3273.	3048.	2839.	2644.	2464.	2296.
2140.	1994.	1859.	1734.	1617.	1509.	1408.	1314.	1227.	1146.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	15590.	15110.	11089.	4905.	354587.
INCHES		0.73	2.14	2.84	2.85
AC-FT		7496.	22006.	29204.	29320.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	118.	121.	128.	139.	154.	175.
210.	277.	388.	548.	762.	1031.	1389.	1900.	2621.	3707.
5263.	7221.	9461.	11848.	14265.	16616.	18777.	20609.	22023.	22960.
23385.	23296.	22686.	21641.	20379.	19076.	17816.	16625.	15499.	14437.
13437.	12501.	11629.	10818.	10064.	9364.	8713.	8107.	7545.	7022.
6535.	6083.	5663.	5273.	4910.	4572.	4258.	3967.	3695.	3444.
3209.	2992.	2789.	2601.	2426.	2263.	2112.	1972.	1841.	1720.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23385.	22665.	16634.	7358.	531881.
INCHES		1.09	3.21	4.26	4.27
AC-FT		11245.	33010.	43806.	43980.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	157.	162.	171.	185.	206.	233.
280.	370.	518.	731.	1016.	1375.	1853.	2533.	3494.	4942.
7018.	9628.	12615.	15798.	19021.	22155.	25036.	27478.	29364.	30613.
31179.	31061.	30247.	28855.	27173.	25435.	23755.	22166.	20665.	19249.
17916.	16668.	15505.	14424.	13419.	12485.	11617.	10810.	10060.	9362.
8714.	8111.	7551.	7030.	6546.	6096.	5678.	5289.	4927.	4591.
4279.	3989.	3719.	3468.	3235.	3018.	2816.	2629.	2455.	2293.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	31179.	30220.	22178.	9811.	709175.
INCHES		1.46	4.28	5.67	5.70
AC-FT		14993.	44013.	58408.	58640.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	196.	202.	213.	232.	257.	291.
350.	462.	647.	914.	1270.	1718.	2316.	3166.	4368.	6178.
8772.	12035.	15768.	19747.	23776.	27694.	31294.	34348.	36705.	38267.
38974.	38826.	37809.	36068.	33966.	31794.	29694.	27708.	25831.	24061.
22395.	20835.	19381.	18030.	16774.	15606.	14521.	13512.	12574.	11703.
10892.	10139.	9439.	8788.	8183.	7620.	7097.	6611.	6159.	5739.
5349.	4986.	4648.	4335.	4043.	3772.	3520.	3286.	3063.	2866.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	38974.	37775.	27723.	12263.	886469.
INCHES		1.82	5.34	7.09	7.12
AC-FT		18741.	55016.	73009.	73300.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

234.	234.	234.	234.	234.	234.	234.	234.	234.	234.

234.	234.	234.	234.	236.	242.	256.	278.	307.	349.
420.	555.	776.	1097.	1523.	2062.	2779.	3799.	5241.	7413.
10526.	14442.	18922.	23697.	28531.	33233.	37553.	41218.	44041.	45920.
46769.	46591.	45371.	43282.	40759.	38153.	35633.	33249.	30997.	28873.
26874.	25002.	23257.	21636.	20129.	18728.	17425.	16215.	15097.	14043.
13071.	12167.	11326.	10545.	9819.	9144.	8517.	7933.	7311.	6887.
6419.	5983.	5578.	5202.	4852.	4527.	4224.	3943.	3682.	3439.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	46769.	45330.	33268.	14716.	1063761.
INCHES		2.18	6.41	8.51	8.55
AC-FT		22489.	66019.	87611.	87959.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	275.	283.	299.	324.	360.	407.
490.	647.	906.	1279.	1777.	2405.	3242.	4433.	6135.	8649.
12281.	16849.	22076.	27646.	33286.	38772.	43812.	48087.	51387.	53573.
54564.	54357.	52933.	50496.	47552.	44511.	41572.	38791.	36164.	33685.
31353.	29168.	27134.	25242.	23484.	21849.	20330.	18917.	17604.	16384.
15249.	14194.	13214.	12303.	11456.	10668.	9936.	9256.	8623.	8035.
7488.	6980.	6508.	6069.	5661.	5281.	4928.	4601.	4296.	4013.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	54564.	52885.	38812.	17168.	1241044.
INCHES		2.55	7.48	9.93	9.97
AC-FT		26237.	77022.	102212.	102619.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	314.	323.	341.	370.	412.	466.
560.	740.	1035.	1462.	2031.	2749.	3705.	5066.	6983.	9884.
14035.	19255.	25229.	31595.	38041.	44310.	50071.	54957.	58723.	61227.
62359.	62122.	60495.	57709.	54345.	50870.	47510.	44332.	41330.	38497.
35832.	33335.	31010.	28848.	26838.	24970.	23234.	21620.	20117.	18724.
17428.	16222.	15102.	14060.	13092.	12192.	11355.	10578.	9855.	9183.
8558.	7977.	7438.	6936.	6469.	6036.	5633.	5258.	4910.	4586.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	62359.	60440.	44357.	19621.	1418336.
INCHES		2.91	8.55	11.35	11.39
AC-FT		29986.	88025.	116814.	117278.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	393.	404.	427.	463.	514.	582.
700.	925.	1294.	1828.	2539.	3436.	4632.	6332.	8735.	12355.
17544.	24069.	31537.	39494.	47551.	55388.	62589.	68696.	73410.	76533.
77948.	77652.	75618.	72136.	67931.	63588.	59388.	55416.	51662.	48122.
44790.	41669.	38762.	36060.	33548.	31213.	29042.	27024.	25149.	23405.
21784.	20278.	18877.	17575.	16365.	15240.	14194.	13222.	123[illegible]3.	11478.
10698.	9972.	9297.	8670.	8087.	7545.	7041.	6572.	6107.	5732.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	77948.	75550.	55446.	24526.	1772921.
INCHES		3.64	10.69	14.19	14.24
AC-FT		37482.	110031.	146017.	146598.

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ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	1

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE=	0.	7464.	15756.	24048.	32340.	40632.	51688.	0.	0.	0.
OUTFLOW=	0.	23043.	37813.	62979.	115513.	183538.	294386.	0.	0.	0.

STATION 1, PLAN 1, RTIO 1

39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	40.	41.	43.	45.
50.	57.	69.	89.	118.	159.	214.	290.	395.	544.
759.	1058.	1448.	1924.	2473.	3078.	3717.	4361.	4982.	5551.
6043.	6436.	6714.	6866.	6897.	6825.	6672.	6461.	6210.	5934.
5643.	5344.	5045.	4750.	4463.	4185.	3920.	3667.	3428.	3202.
2988.	2788.	2600.	2424.	2260.	2106.	1962.	1829.	1704.	1587.
1479.	1378.	1284.	1197.	1116.	1040.	970.	904.	844.	787.

STOR

13.	13.	13.	13.	13.	13.	13.	13.	13.	13.
13.	13.	13.	13.	13.	13.	13.	13.	13.	13.
13.	13.	13.	13.	13.	13.	13.	13.	14.	15.
16.	18.	22.	29.	38.	51.	69.	94.	128.	176.
246.	343.	469.	623.	801.	997.	1204.	1413.	1614.	1798.
1957.	2085.	2175.	2224.	2234.	2211.	2161.	2093.	2012.	1922.
1828.	1731.	1634.	1539.	1445.	1356.	1270.	1188.	1110.	1037.
968.	903.	842.	785.	732.	682.	636.	592.	552.	514.
479.	446.	416.	388.	361.	337.	314.	293.	273.	255.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6897.	6739.	5305.	2413.	174469.
INCHES		0.32	1.02	1.40	1.40
AC-FT		3343.	10527.	14368.	14426.

STATION 1, PLAN 1, RTIO 2

78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	79.	82.	85.	91.
99.	114.	138.	177.	236.	318.	429.	580.	789.	1088.
1518.	2116.	2896.	3848.	4947.	6157.	7433.	8722.	9964.	11102.
12086.	12872.	13427.	13732.	13794.	13649.	13343.	12922.	12421.	11868.
11285.	10688.	10089.	9499.	8925.	8371.	7840.	7335.	6856.	6403.
5977.	5576.	5200.	4848.	4519.	4212.	3925.	3657.	3408.	3175.
2958.	2757.	2569.	2394.	2232.	2080.	1940.	1809.	1687.	1574.

STOR

25.	25.	25.	25.	25.	25.	25.	25.	25.	25.
25.	25.	25.	25.	25.	25.	25.	25.	25.	25.
25.	25.	25.	25.	25.	25.	26.	26.	28.	29.
32.	37.	45.	57.	76.	103.	139.	188.	256.	352.
492.	686.	938.	1246.	1602.	1994.	2408.	2825.	3227.	3596.
3915.	4169.	4349.	4448.	4468.	4421.	4322.	4186.	4023.	3844.
3655.	3462.	3268.	3077.	2891.	2711.	2540.	2376.	2221.	2074.
1936.	1806.	1684.	1571.	1464.	1364.	1271.	1185.	1104.	1028.
958.	893.	832.	776.	723.	674.	628.	586.	545.	510.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	13794.	13478.	10609.	4827.	348938.
INCHES		0.65	2.05	2.79	2.80
AC-FT		6687.	21054.	28737.	28853.

STATION 1, PLAN 1, RTIO 3

117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	118.	119.	122.	123.	136.
149.	170.	207.	266.	354.	477.	643.	869.	118[illegible].	1632.
2278.	3175.	4344.	5772.	7420.	9235.	11150.	13083.	1494[illegible].	16653.
18128.	19308.	20141.	20599.	20692.	20474.	20015.	19383.	18631.	17802.
16928.	16032.	15134.	14249.	13388.	12556.	11760.	11002.	10284.	9605.
8965.	8364.	7801.	7273.	6779.	6318.	5887.	5486.	5111.	4762.
4430.	4135.	3853.	3591.	3347.	3120.	2909.	2713.	2531.	2361.

STOR

38.	38.	38.	38.	38.	38.	38.	38.	38.	38.
38.	38.	38.	38.	38.	38.	38.	38.	38.	38.
38.	38.	38.	38.	38.	38.	39.	40.	4[illegible].	44.
48.	55.	67.	86.	115.	154.	208.	282.	384.	529.
738.	1028.	1407.	1870.	2403.	2991.	3612.	4238.	4841.	5394.
5872.	6254.	6524.	6672.	6702.	6632.	6483.	6278.	6035.	5766.
5483.	5193.	4902.	4616.	4336.	4067.	3809.	3564.	3331.	3111.
2904.	2709.	2527.	2356.	2196.	2046.	1907.	1777.	1655.	1543.
1437.	1339.	1248.	1163.	1084.	1011.	942.	879.	820.	765.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	20692.	20217.	15914.	7240.	523407.
INCHES		0.97	3.07	4.19	4.20
AC-FT		10030.	31581.	43105.	43279.

STATION 1, PLAN 1, RTIO 4

156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	157.	159.	163.	17[illegible].	182.
199.	227.	276.	355.	472.	636.	857.	1159.	1579.	2176.
3037.	4233.	5791.	7696.	9893.	12313.	14866.	17444.	19928.	22204.
23727.	24740.	25551.	26100.	26362.	26354.	26113.	25681.	25096.	24391.
23595.	22527.	21070.	19688.	18383.	17154.	16000.	14917.	13902.	12954.
12068.	11241.	10469.	9750.	9080.	8456.	7874.	7333.	6830.	6361.
5925.	5520.	5143.	4792.	4466.	4163.	3881.	3619.	3375.	3149.

STOR

51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	53.	55.	59.
64.	74.	89.	115.	153.	206.	278.	376.	511.	705.
984.	1371.	1876.	2493.	3205.	3988.	4815.	5650.	6455.	7192.
7848.	8417.	8872.	9180.	9327.	9323.	9187.	8945.	8616.	8221.
7774.	7297.	6825.	6377.	5955.	5557.	5183.	4832.	4503.	4196.
3909.	3641.	3391.	3158.	2941.	2739.	2551.	2375.	2212.	2061.
1919.	1788.	1666.	1552.	1447.	1348.	1257.	1172.	1097.	1020.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	26362.	26027.	21198.	9654.	697872.
INCHES		1.25	4.09	5.58	5.61
AC-FT		12912.	42067.	57473.	57705.

STATION 1, PLAN 1, RTIO 5

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	196.	199.	204.	213.	227.
248.	284.	345.	444.	590.	795.	1071.	1449.	1974.	2720.
3796.	5291.	7239.	9619.	12367.	15392.	18583.	21805.	24171.	25999.
27730.	29262.	30503.	31386.	31884.	32020.	31845.	31414.	30777.	29978.
29052.	28032.	26946.	25816.	24662.	23501.	21889.	20108.	18509.	17068.
15762.	14575.	13492.	12501.	11592.	10757.	9988.	9279.	8624.	8019.
7459.	6940.	6460.	6015.	5601.	5218.	4863.	4532.	4226.	3941.

63.	63.	63.	63.	63.	63.	63.	63.	63.	63.
63.	63.	63.	63.	63.	63.	63.	63.	63.	63.
63.	63.	63.	63.	63.	64.	64.	66.	69.	74.
80.	92.	112.	144.	191.	257.	347.	469.	639.	881.
1230.	1714.	2345.	3116.	4006.	4986.	6019.	7063.	8099.	9124.
10095.	10955.	11652.	12148.	12427.	12504.	12406.	12164.	11806.	11357.
10838.	10265.	9655.	9021.	8373.	7721.	7090.	6513.	5995.	5528.
5106.	4721.	4370.	4049.	3755.	3484.	3235.	3006.	2794.	2597.
2416.	2248.	2092.	1948.	1814.	1690.	1575.	1463.	1369.	1277.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	32020.	31554.	26372.	12067.	872323.
INCHES		1.52	5.08	6.98	7.01
AC-FT		15655.	52336.	71840.	72130.

STATION 1, PLAN 1, RTIO 6

234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	235.	238.	245.	256.	272.
298.	341.	414.	532.	708.	954.	1286.	1739.	2368.	3264.
4555.	6349.	8687.	11543.	14840.	18470.	22299.	24935.	27362.	29778.
32049.	34056.	35691.	36875.	37580.	37853.	37746.	37258.	36554.	35647.
34581.	33396.	32125.	30798.	29438.	28066.	26696.	25342.	24013.	22507.
20481.	18702.	17128.	15727.	14472.	13343.	12322.	11395.	10550.	9778.
9071.	8422.	7824.	7273.	6765.	6295.	5861.	5459.	5086.	4741.

STOR

76.	76.	76.	76.	76.	76.	76.	76.	76.	76.
76.	76.	76.	76.	76.	76.	76.	76.	76.	76.
76.	76.	76.	76.	76.	76.	77.	79.	83.	88.
96.	110.	134.	172.	229.	309.	416.	563.	767.	1057.
1475.	2057.	2814.	3739.	4807.	5983.	7223.	8526.	9889.	11245.
12520.	13647.	14565.	15229.	15625.	15769.	15696.	15445.	15049.	14540.
13941.	13276.	12563.	11818.	11054.	10284.	9515.	8755.	8009.	7290.
6634.	6058.	5548.	5094.	4688.	4322.	3971.	3691.	3417.	3167.
2938.	2728.	2534.	2356.	2191.	2039.	1878.	1768.	1648.	1536.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	37853.	37304.	31358.	14480.	1046747.
INCHES		1.80	6.05	8.37	8.41
AC-FT		18508.	62231.	86204.	86553.

STATION 1, PLAN 1, RTIO 7

273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	275.	278.	286.	298.	318.
347.	397.	483.	621.	826.	1113.	1500.	2029.	2763.	3808.
5314.	7407.	10135.	13467.	17314.	21548.	24844.	27738.	30755.	33734.
36522.	39712.	42818.	44800.	45742.	45806.	45190.	44074.	42604.	40892.
39026.	37357.	36095.	34737.	33314.	31854.	30378.	28903.	27444.	26011.
24613.	23257.	21235.	19317.	17634.	16147.	14824.	13641.	12577.	11616.
10744.	9950.	9224.	8560.	7950.	7389.	6872.	6395.	5955.	5547.

STOR

88.	88.	88.	88.	88.	88.	88.	88.	88.	88.
88.	88.	88.	88.	88.	88.	88.	88.	88.	88.
88.	88.	88.	88.	89.	89.	90.	93.	97.	103.
113.	129.	157.	201.	268.	360.	486.	657.	895.	1234.
1721.	2399.	3283.	4362.	5608.	6980.	8475.	10100.	11793.	13466.
15031.	16382.	17405.	18058.	18368.	18390.	18187.	17819.	17334.	16771.
16156.	15500.	14791.	14029.	13230.	12411.	11582.	10754.	9935.	9130.
8346.	7584.	6878.	6257.	5712.	5230.	4802.	4419.	4074.	3763.
3480.	3223.	2988.	2773.	2575.	2393.	2226.	2072.	1929.	1797.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME

C-36

INCHES		2.16	6.99	9.77	9.81
AC-FT		22196.	71967.	100566.	100973.

STATION 1, PLAN 1, RTIO 8

312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	314.	318.	327.	341.	363.
397.	454.	552.	710.	944.	1272.	1714.	2319.	3153.	4352.
6074.	8466.	11583.	15391.	19787.	24003.	27182.	30656.	34246.	37774.
43103.	47368.	50475.	52398.	53207.	53073.	52208.	50807.	49029.	46998.
44806.	42528.	40220.	37926.	36500.	35047.	33546.	32022.	30493.	28975.
27480.	26019.	24599.	23225.	21160.	19233.	17545.	16057.	14735.	13555.
12495.	11538.	10671.	9883.	9163.	8505.	7900.	7345.	6833.	6361.

STOR

101.	101.	101.	101.	101.	101.	101.	101.	101.	101.
101.	101.	101.	101.	101.	101.	101.	101.	101.	101.
101.	101.	101.	101.	101.	102.	103.	106.	110.	118.
129.	147.	179.	230.	306.	412.	555.	751.	1023.	1410.
1967.	2742.	3752.	4985.	6409.	8003.	9788.	11738.	13754.	15734.
17499.	18904.	19928.	20562.	20828.	20784.	20499.	20037.	19452.	18782.
18060.	17309.	16549.	15793.	15019.	14203.	13361.	12505.	11645.	10794.
9955.	9135.	8338.	7566.	6854.	6230.	5683.	5201.	4773.	4391.
4047.	3737.	3457.	3201.	2968.	2755.	2559.	2379.	2213.	2061.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	53207.	52028.	41287.	19304.	1395516.
INCHES		2.51	7.96	11.17	11.21
AC-FT		25812.	81933.	114927.	115391.

STATION 1, PLAN 1, RTIO 9

390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	392.	397.	408.	426.	454.
496.	568.	690.	887.	1181.	1590.	2143.	2898.	3947.	5440.
7592.	10582.	14479.	19239.	24067.	27825.	32098.	36697.	43657.	50636.
56565.	61298.	66214.	69394.	69659.	68041.	65322.	62472.	60481.	58121.
55521.	52782.	49981.	47179.	44421.	41738.	39150.	37111.	35600.	34047.
32477.	30907.	29354.	27828.	26339.	24894.	23499.	21580.	19587.	17847.
16318.	14964.	13758.	12677.	11705.	10825.	10025.	9297.	8631.	8021.

STOR

126.	126.	126.	126.	126.	126.	126.	126.	126.	126.
126.	126.	126.	126.	126.	126.	126.	126.	126.	126.
126.	126.	126.	126.	126.	127.	129.	132.	138.	147.
161.	184.	224.	287.	382.	515.	694.	939.	1279.	1762.
2459.	3428.	4690.	6232.	8039.	10149.	12547.	15130.	17681.	19981.
21935.	23494.	24559.	25060.	25102.	24847.	24418.	23881.	23225.	22447.
21591.	20688.	19765.	18842.	17933.	17049.	16197.	15362.	14513.	13642.
12760.	11879.	11007.	10150.	9315.	8503.	7720.	6990.	6344.	5781.
5286.	4847.	4456.	4106.	3791.	3506.	3247.	3011.	2796.	2598.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	69659.	66850.	51607.	24127.	1744158.
INCHES		3.22	9.95	13.95	14.01
AC-FT		33166.	102413.	143639.	144220.

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PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

			RATIOS APPLIED TO FLOWS								
OPERATION	STATION	PLAN	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00
HYDROGRAPH AT	1	1	7795.	15590.	23385.	31179.	38974.	46769.	54564.	62359.	77948.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
ROUTED TO	1	1	6897.	13794.	20692.	26362.	32020.	37853.	45806.	53207.	69659.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.

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EC-1 VERSION DATED JAN 1973
PDATED AUG 74
HANGE NO. 01
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SALMON RIVER DAM
RESERVOIR ROUTING OF P.M.F. - SNYDER METHOD
500 FOOT UNCONTROLLED SPILLWAY PLUS CONTROLLED TAINTER GATED SPILLWAY

JOB SPECIFICATION

JOPER	NWT
5	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1
RTIOS= 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	193.00	0.0	193.00	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	19.20	75.00	89.00	100.00	106.00	0.0	0.0

SPC COMPUTED BY THE PROGRAM IS 0.882

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.10	0.0	0.0

UNIT HYDROGRAPH DATA
TP= 11.20 CP=0.63 NTA= 0

RECESSION DATA
STRTQ= 390.00 QRCSN= 390.00 RTIOR= 1.00
PROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=12.21 AND R=10.25 INTERVALS

UNIT HYDROGRAPH 61 END-OF-PERIOD ORDINATES, LAG= 11.10 HOURS, CP= 0.63 VOL= 1.00

192.	716.	1454.	2311.	3243.	4226.	5194.	6022.	6640.	7049.
7242.	7182.	6770.	6160.	5587.	5067.	4596.	4169.	3781.	3430.
3111.	2821.	2559.	2321.	2105.	1910.	1732.	1571.	1425.	1292.
1172.	1063.	964.	875.	793.	720.	653.	592.	537.	487.
442.	401.	363.	330.	299.	271.	246.	223.	202.	184.
166.	151.	137.	124.	113.	102.	93.	84.	76.	69.
63.									

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.01	0.00	390.
2	0.01	0.00	390.
3	0.01	0.00	390.
4	0.01	0.00	390.
5	0.01	0.00	390.
6	0.01	0.00	390.
7	0.02	0.00	390.
8	0.02	0.00	390.
9	0.02	0.00	390.
10	0.02	0.00	390.
11	0.02	0.00	390.
12	0.02	0.00	390.
13	0.08	0.00	390.
14	0.09	0.00	390.
15	0.11	0.00	390.
16	0.29	0.00	390.
17	0.11	0.00	390.

20	0.01	0.00	390.
21	0.01	0.00	390.
22	0.01	0.00	390.
23	0.01	0.00	390.
24	0.01	0.00	390.
25	0.12	0.02	395.
26	0.12	0.02	412.
27	0.12	0.02	447.
28	0.12	0.02	503.
29	0.12	0.02	581.
30	0.12	0.02	683.
31	0.39	0.29	860.
32	0.39	0.29	1200.
33	0.39	0.29	1754.
34	0.39	0.29	2550.
35	0.39	0.29	3603.
36	0.39	0.29	4920.
37	1.27	1.17	6658.
38	1.52	1.42	9113.
39	1.90	1.80	12573.
40	4.82	4.72	17827.
41	1.78	1.68	25383.
42	1.40	1.30	34819.
43	0.19	0.09	45405.
44	0.19	0.09	56360.
45	0.19	0.09	67079.
46	0.19	0.09	76922.
47	0.19	0.09	85104.
48	0.19	0.09	91041.
49	0.0	0.0	94376.
50	0.0	0.0	94981.
51	0.0	0.0	92951.
52	0.0	0.0	88348.
53	0.0	0.0	82087.
54	0.0	0.0	75401.
55	0.0	0.0	68902.
56	0.0	0.0	62871.
57	0.0	0.0	57300.
58	0.0	0.0	52158.
59	0.0	0.0	47420.
60	0.0	0.0	43071.
61	0.0	0.0	39104.
62	0.0	0.0	35504.
63	0.0	0.0	32239.
64	0.0	0.0	29278.
65	0.0	0.0	26592.
66	0.0	0.0	24155.
67	0.0	0.0	21945.
68	0.0	0.0	19941.
69	0.0	0.0	18123.
70	0.0	0.0	16474.
71	0.0	0.0	14979.
72	0.0	0.0	13622.
73	0.0	0.0	12392.
74	0.0	0.0	11276.
75	0.0	0.0	10264.
76	0.0	0.0	9345.
77	0.0	0.0	8513.
78	0.0	0.0	7757.
79	0.0	0.0	7072.
80	0.0	0.0	6451.
81	0.0	0.0	5887.
82	0.0	0.0	5376.
83	0.0	0.0	4913.

86	0.0	0.0	3763.
87	0.0	0.0	3448.
88	0.0	0.0	3163.
89	0.0	0.0	2903.
90	0.0	0.0	2668.
91	0.0	0.0	2455.
92	0.0	0.0	2246.
93	0.0	0.0	2057.
94	0.0	0.0	1885.
95	0.0	0.0	1729.
96	0.0	0.0	1588.
97	0.0	0.0	1460.
98	0.0	0.0	1294.
99	0.0	0.0	1129.
100	0.0	0.0	957.
101	0.0	0.0	636.
102	0.0	0.0	518.
103	0.0	0.0	432.
104	0.0	0.0	423.
105	0.0	0.0	415.
106	0.0	0.0	408.
107	0.0	0.0	401.
108	0.0	0.0	395.
109	0.0	0.0	390.
110	0.0	0.0	390.
111	0.0	0.0	390.
112	0.0	0.0	390.
113	0.0	0.0	390.
114	0.0	0.0	390.
115	0.0	0.0	390.
116	0.0	0.0	390.
117	0.0	0.0	390.
118	0.0	0.0	390.
119	0.0	0.0	390.
120	0.0	0.0	390.
121	0.0	0.0	390.
122	0.0	0.0	390.
123	0.0	0.0	390.
124	0.0	0.0	390.
125	0.0	0.0	390.
126	0.0	0.0	390.
127	0.0	0.0	390.
128	0.0	0.0	390.
129	0.0	0.0	390.
130	0.0	0.0	390.
131	0.0	0.0	390.
132	0.0	0.0	390.
133	0.0	0.0	390.
134	0.0	0.0	390.
135	0.0	0.0	390.
136	0.0	0.0	390.
137	0.0	0.0	390.
138	0.0	0.0	390.
139	0.0	0.0	390.
140	0.0	0.0	390.
141	0.0	0.0	390.
142	0.0	0.0	390.
143	0.0	0.0	390.
144	0.0	0.0	390.
145	0.0	0.0	390.
146	0.0	0.0	390.
147	0.0	0.0	390.
148	0.0	0.0	390.
149	0.0	0.0	390.

SUM 17.89 14.49 1857976.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	94981.	91133.	61638.	25373.	1857952.
INCHES		4.39	11.88	14.68	14.93
AC-FT		45213.	122319.	151060.	153629.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	41.	45.	50.	58.	68.
86.	120.	175.	255.	360.	492.	666.	911.	1257.	1783.
2538.	3482.	4541.	5636.	6708.	7692.	8510.	9104.	9438.	9498.
9295.	8835.	8209.	7540.	6890.	6287.	5730.	5216.	4742.	4307.
3910.	3550.	3224.	2928.	2659.	2416.	2195.	1994.	1812.	1647.
1498.	1362.	1239.	1128.	1026.	935.	851.	776.	707.	645.
589.	538.	491.	449.	411.	376.	345.	316.	290.	267.
246.	225.	206.	189.	173.	159.	146.	129.	113.	96.
64.	52.	43.	42.	42.	41.	40.	40.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9498.	9113.	6164.	2537.	185793.
INCHES		0.44	1.19	1.47	1.49
AC-FT		4521.	12232.	15106.	15363.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	79.	82.	89.	101.	116.	137.
172.	240.	351.	510.	721.	984.	1332.	1823.	2515.	3565.
5077.	6964.	9081.	11272.	13416.	15384.	17021.	18208.	18875.	18996.
18590.	17670.	16417.	15080.	13780.	12574.	11460.	10432.	9484.	8614.
7821.	7101.	6448.	5856.	5318.	4831.	4389.	3988.	3625.	3295.
2996.	2724.	2478.	2255.	2053.	1869.	1703.	1551.	1414.	1290.
1177.	1075.	983.	898.	822.	753.	690.	633.	581.	534.
491.	449.	411.	377.	346.	318.	292.	259.	226.	191.
127.	104.	86.	85.	83.	82.	80.	79.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	18996.	18227.	12328.	5075.	371590.
INCHES		0.88	2.38	2.94	2.99
AC-FT		9043.	24464.	30212.	30726.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	118.	124.	134.	151.	174.	205.
258.	360.	526.	765.	1081.	1476.	1997.	2734.	3772.	5348.
7615.	10446.	13622.	16908.	20124.	23077.	25531.	27312.	28313.	28494.
27885.	26504.	24626.	22620.	20671.	18861.	17190.	15647.	14226.	12921.
11731.	10651.	9672.	8783.	7977.	7247.	6584.	5982.	5437.	4942.
4494.	4087.	3718.	3383.	3079.	2804.	2554.	2327.	2122.	1935.
1766.	1613.	1474.	1348.	1233.	1129.	1034.	949.	871.	800.
737.	674.	617.	566.	519.	476.	438.	388.	339.	287.
191.	155.	130.	127.	125.	122.	120.	119.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.

117.	117.	117.	117.	117.	117.	117.	117.	117.	117.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	28494.	27340.	18491.	7612.	557388.
INCHES		1.32	3.57	4.40	4.48
AC-FT		13564.	36696.	45318.	46089.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	158.	165.	179.	201.	232.	273.
344.	480.	701.	1020.	1441.	1968.	2663.	3645.	5029.	7131.
10153.	13928.	18162.	22544.	26831.	30769.	34042.	36416.	37750.	37993.
37180.	35339.	32835.	30160.	27561.	25148.	22920.	20863.	18968.	17228.
15642.	14202.	12896.	11711.	10637.	9662.	8778.	7976.	7249.	6590.
5991.	5449.	4957.	4510.	4105.	3738.	3405.	3103.	2829.	2580.
2355.	2150.	1965.	1797.	1644.	1505.	1379.	1265.	1161.	1067.
982.	899.	823.	754.	692.	635.	584.	518.	452.	383.
254.	207.	173.	169.	166.	163.	161.	158.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	37993.	36453.	24655.	10149.	743184.
INCHES		1.76	4.75	5.87	5.97
AC-FT		18085.	48928.	60424.	61452.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	197.	206.	224.	251.	291.	341.
430.	600.	877.	1275.	1801.	2460.	3329.	4556.	6286.	8913.
12692.	17409.	22703.	28180.	33539.	38461.	42552.	45520.	47188.	47491.
46476.	44174.	41043.	37701.	34451.	31436.	28650.	26079.	23710.	21535.
19552.	17752.	16120.	14639.	13296.	12078.	10973.	9971.	9062.	8237.
7489.	6811.	6196.	5638.	5132.	4673.	4256.	3879.	3536.	3225.
2944.	2688.	2456.	2246.	2055.	1882.	1724.	1581.	1452.	1334.
1228.	1123.	1028.	943.	865.	794.	730.	647.	564.	479.
318.	259.	216.	212.	208.	204.	201.	198.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	47491.	45567.	30819.	12687.	928981.
INCHES		2.20	5.94	7.34	7.46
AC-FT		22607.	61160.	75531.	76815.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	237.	247.	268.	302.	349.	410.
516.	720.	1052.	1530.	2162.	2952.	3995.	5468.	7543.	10696.
15230.	20891.	27243.	33816.	40247.	46153.	51062.	54625.	56625.	56989.
55771.	53008.	49252.	45241.	41341.	37723.	34380.	31294.	28452.	25843.
23462.	21302.	19343.	17567.	15955.	14493.	13167.	11965.	10874.	9885.
8987.	8173.	7435.	6765.	6158.	5607.	5108.	4654.	4243.	3871.
3532.	3226.	2948.	2695.	2466.	2258.	2069.	1898.	1742.	1601.
1473.	1348.	1234.	1131.	1038.	953.	876.	776.	677.	574.
382.	311.	259.	254.	249.	245.	241.	237.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.

234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234	234.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	56989.	54680.	36983.	15224.	1114723.
INCHES		2.64	7.13	8.81	8.95
AC-FT		27128.	73392.	90635.	92173.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	276.	288.	313.	352.	407.	478.
602.	840.	1228.	1785.	2522.	3444.	4661.	6379.	8801.	12479.
17768.	24373.	31784.	39452.	46755.	53845.	59573.	63729.	66063.	66487.
65066.	61843.	57461.	52781.	48231.	44010.	40110.	36510.	33194.	30150.
27373.	24853.	22567.	20494.	18614.	16909.	15362.	13959.	12686.	11532.
10485.	9535.	8674.	7893.	7184.	6542.	5959.	5430.	4951.	4516.
4121.	3763.	3439.	3144.	2877.	2634.	2414.	2214.	2032.	1868.
1719.	1572.	1440.	1320.	1211.	1112.	1022.	906.	790.	670.
445.	362.	302.	296.	291.	286.	281.	277.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	66487.	63793.	43146.	17761.	1300513.
INCHES		3.07	8.32	10.27	10.45
AC-FT		31649.	85624.	105741.	107536.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	316.	330.	358.	402.	465.	546.
688.	960.	1403.	2040.	2882.	3936.	5326.	7290.	10058.	14261.
20306.	27855.	36324.	45088.	53663.	61537.	68083.	72833.	75500.	75985.
74361.	70678.	65669.	60321.	55121.	50297.	45840.	41726.	37936.	34457.
31283.	28403.	25791.	23422.	21273.	19324.	17556.	15953.	14498.	13179.
11983.	10898.	9913.	9021.	8211.	7476.	6810.	6206.	5658.	5161.
4710.	4301.	3930.	3594.	3289.	3011.	2759.	2530.	2323.	2135.
1964.	1797.	1645.	1508.	1383.	1270.	1168.	1035.	903.	766.
509.	414.	346.	339.	332.	326.	321.	316.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	75985.	72907.	49310.	20299.	1486310.
INCHES		3.51	9.51	11.74	11.94
AC-FT		36171.	97855.	120847.	122899.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	395.	412.	447.	503.	581.	683.
860.	1200.	1754.	2550.	3603.	4920.	6658.	9113.	12572.	17827.
25383.	34819.	45405.	56360.	67079.	76922.	85104.	91041.	94375.	94981.
92951.	88347.	82087.	75401.	68902.	62871.	57299.	52157.	47420.	43071.
39104.	35504.	32239.	29278.	26591.	24155.	21945.	19941.	18123.	16474.
14979.	13622.	12392.	11276.	10263.	9345.	8513.	7757.	7072.	6451.
5887.	5376.	4913.	4492.	4111.	3763.	3448.	3163.	2903.	2668.
2455.	2246.	2057.	1885.	1729.	1588.	1460.	1294.	1129.	957.
636.	518.	432.	423.	415.	408.	401.	395.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.

390.	390.	390.	390.	390.	390.	390.	390.	390.	390.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	94981.	91133.	61637.	25373.	1857902.
INCHES		4.39	11.88	14.68	14.92
AC-FT		45213.	122319.	151059.	153625.

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HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	1

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE=	0.	2764.	11056.	19348.	27640.	35932.	46986.	0.	0.	0.
OUTFLOW=	0.	23043.	37813.	62979.	115513.	183538.	294386.	0.	0.	0.

STATION 1, PLAN 1, RTIO 1

39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	40.	41.	45.	49.	57.
67.	85.	117.	167.	239.	335.	460.	628.	862.	1199.
1692.	2367.	3210.	4172.	5197.	6223.	7186.	8017.	8659.	9074.
9239.	9150.	8828.	8339.	7763.	7161.	6571.	6008.	5481.	4991.
4539.	4125.	3747.	3403.	3091.	2807.	2550.	2316.	2105.	1913.
1738.	1580.	1437.	1307.	1189.	1082.	985.	897.	817.	745.
679.	620.	566.	517.	472.	432.	395.	362.	332.	305.
280.	257.	235.	216.	198.	181.	167.	152.	136.	120.
99.	78.	62.	52.	47.	44.	42.	41.	40.	40.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.
39.	39.	39.	39.	39.	39.	39.	39.	39.	39.

STOR

5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	6.	7.
8.	10.	14.	20.	29.	40.	55.	75.	103.	144.
203.	284.	385.	500.	623.	747.	862.	962.	1039.	1088.
1108.	1098.	1059.	1000.	931.	859.	788.	721.	657.	599.
544.	495.	449.	408.	371.	337.	306.	278.	252.	229.
209.	190.	172.	157.	143.	130.	118.	108.	98.	89.
81.	74.	68.	62.	57.	52.	47.	43.	40.	37.
34.	31.	28.	26.	24.	22.	20.	18.	16.	14.
12.	9.	7.	6.	6.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9239.	8882.	6124.	2537.	185794.
INCHES		0.43	1.18	1.47	1.49
AC-FT		4406.	12153.	15104.	15363.

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STATION 1, PLAN 1, RTIO 2

78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	79.	83.	89.	99.	113.
134.	171.	235.	335.	479.	670.	920.	1257.	1724.	2398.
3384.	4735.	6420.	8345.	10394.	12447.	14372.	16033.	17319.	18147.
18478.	18300.	17656.	16679.	15526.	14323.	13141.	12016.	10961.	9981.
9077.	8249.	7493.	6806.	6181.	5614.	5100.	4633.	4209.	3825.
3477.	3161.	2874.	2614.	2378.	2164.	1970.	1794.	1635.	1490.
1359.	1240.	1132.	1034.	945.	864.	791.	724.	664.	609.
560.	514.	471.	432.	396.	363.	333.	304.	272.	240.
198.	156.	125.	105.	94.	88.	84.	82.	80.	79.
79.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.
78.	78.	78.	78.	78.	78.	78.	78.	78.	78.

STOR

9.	9.	9.	9.	9.	9.	9.	9.	9.	9.
9.	9.	9.	9.	9.	9.	9.	9.	9.	9.
9.	9.	9.	9.	9.	10.	10.	11.	12.	14.
16.	21.	28.	40.	57.	80.	110.	151.	207.	288.
406.	568.	770.	1001.	1247.	1493.	1724.	1923.	2077.	2177.
2216.	2195.	2118.	2001.	1862.	1718.	1576.	1441.	1315.	1197.
1089.	989.	899.	816.	741.	673.	612.	556.	505.	459.
417.	379.	345.	314.	285.	260.	236.	215.	196.	179.
163.	149.	136.	124.	113.	104.	95.	87.	80.	73.
67.	62.	56.	52.	47.	44.	40.	36.	33.	29.
24.	19.	15.	13.	11.	11.	10.	10.	10.	9.
9.	9.	9.	9.	9.	9.	9.	9.	9.	9.
9.	9.	9.	9.	9.	9.	9.	9.	9.	9.
9.	9.	9.	9.	9.	9.	9.	9.	9.	9.
9.	9.	9.	9.	9.	9.	9.	9.	9.	9.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	18478.	17763.	12248.	5074.	371591.
INCHES		0.86	2.36	2.93	2.99
AC-FT		8813.	24307.	30207.	30726.

STATION 1, PLAN 1, RTIO 3

117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	119.	124.	134.	148.	170.
201.	256.	352.	502.	718.	1005.	1380.	1885.	2586.	3598.
5075.	7102.	9629.	12517.	15591.	18670.	21557.	23312.	23930.	24543.
25043.	25338.	25369.	25130.	24652.	23982.	23165.	20043.	17426.	15452.
13850.	12488.	11296.	10236.	9285.	8428.	7653.	6951.	6315.	5738.
5215.	4741.	4311.	3921.	3567.	3247.	2956.	2692.	2452.	2235.
2038.	1859.	1697.	1551.	1417.	1296.	1186.	1087.	996.	914.
839.	771.	706.	647.	593.	544.	500.	455.	408.	359.
298.	234.	187.	157.	141.	132.	127.	123.	120.	119.
118.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.
117.	117.	117.	117.	117.	117.	117.	117.	117.	117.

STOR

14.	14.	14.	14.	14.	14.	14.	14.	14.	14.
14.	14.	14.	14.	14.	14.	14.	14.	14.	14.
14.	14.	14.	14.	14.	14.	15.	16.	18.	20.
24.	31.	42.	60.	86.	121.	166.	226.	310.	432.
609.	852.	1155.	1501.	1870.	2240.	2586.	2915.	3262.	3606.
3887.	4052.	4070.	3936.	3667.	3291.	2833.	2404.	2090.	1853.
1661.	1498.	1355.	1228.	1114.	1011.	918.	834.	757.	688.
626.	569.	517.	470.	428.	389.	355.	323.	294.	268.
244.	223.	204.	186.	170.	155.	142.	130.	119.	110.
101.	92.	85.	78.	71.	65.	60.	55.	49.	43.

14.	14.	14.	14.	14.	14.	14.	14.	14.	14.
14.	14.	14.	14.	14.	14.	14.	14.	14.	14.
14.	14.	14.	14.	14.	14.	14.	14.	14.	14.
14.	14.	14.	14.	14.	14.	14.	14.	14.	14.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	25369.	25012.	18372.	7611.	557388.
INCHES		1.21	3.54	4.40	4.48
AC-FT		12409.	36459.	45311.	46089.

STATION 1, PLAN 1, RTIO 4

156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	159.	166.	178.	198.	226.
268.	342.	469.	670.	957.	1340.	1840.	2513.	3448.	4797.
6767.	9469.	12839.	16690.	20788.	23538.	24754.	26190.	27684.	29081.
30247.	31072.	31485.	31487.	31127.	30472.	29589.	28534.	27352.	26083.
24760.	23411.	19365.	15746.	13403.	11736.	10447.	9386.	8477.	7679.
6967.	6328.	5751.	5230.	4757.	4329.	3941.	3589.	3270.	2980.
2718.	2479.	2263.	2067.	1890.	1728.	1582.	1449.	1328.	1219.
1119.	1027.	942.	863.	791.	726.	666.	607.	544.	479.
397.	312.	249.	209.	188.	176.	169.	164.	160.	158.
157.	157.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
156.	156.	156.	156.	156.	156.	156.	156.	156.	156.

STOR

19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	20.	21.	24.	27.
32.	41.	56.	80.	115.	161.	221.	301.	414.	575.
812.	1136.	1540.	2002.	2494.	3042.	3725.	4531.	5369.	6154.
6808.	7271.	7503.	7504.	7302.	6935.	6439.	5847.	5183.	4471.
3728.	2971.	2323.	1889.	1608.	1408.	1253.	1126.	1017.	921.
836.	759.	690.	627.	571.	519.	473.	430.	392.	357.
326.	297.	271.	248.	227.	207.	190.	174.	159.	146.
134.	123.	113.	104.	95.	87.	80.	73.	65.	57.
48.	37.	30.	25.	23.	21.	20.	20.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	31487.	30981.	24476.	10148.	743184.
INCHES		1.49	4.72	5.87	5.97
AC-FT		15371.	48573.	60415.	61452.

STATION 1, PLAN 1, RTIO 5

195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	196.	199.	207.	223.	247.	283.
335.	427.	587.	837.	1196.	1675.	2300.	3142.	4310.	5996.
8459.	11837.	16049.	20862.	23830.	25499.	27557.	29816.	32084.	34176.
35932.	37220.	38050.	38344.	37839.	37158.	36182.	34973.	33591.	32087.
30504.	28879.	27241.	25615.	24018.	20880.	16086.	13209.	11316.	9950.
8880.	7994.	7230.	6557.	5956.	5416.	4928.	4487.	4088.	3725.
3397.	3099.	2829.	2584.	2362.	2160.	1977.	1811.	1660.	1523.
1399.	1284.	1177.	1079.	989.	907.	833.	759.	680.	599.
496.	390.	312.	261.	235.	220.	211.	205.	201.	198.
196.	196.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195.	195.
195.	195.	195.	195.	195.	195.	195.	195.	195	195.

STOR

23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	24.	25.	27.	30.	34.
40.	51.	70.	100.	144.	201.	276.	377.	517.	719.
1015.	1420.	1925.	2502.	3206.	4143.	5298.	6567.	7840.	9014.
10000.	10723.	11134.	11231.	11064.	10688.	10140.	9462.	8686.	7841.
6953.	6040.	5121.	4208.	3311.	2505.	1929.	1584.	1357.	1193.
1065.	959.	867.	787.	714.	650.	591.	538.	490.	447.
407.	372.	339.	310.	283.	259.	237.	217.	199.	183.
168.	154.	141.	129.	119.	109.	100.	91.	82.	72.
60.	47.	37.	31.	28.	26.	25.	25.	24.	24.
24.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	38344.	37465.	30351.	12685.	928981.
INCHES		1.81	5.85	7.34	7.46
AC-FT		18587.	60231.	75519.	76815.

STATION 1, PLAN 1, RTIO 6

234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	235.	238.	248.	267.	297.	339.
403.	513.	704.	1005.	1436.	2010.	2760.	3770.	5172.	7195.
10151.	14204.	19259.	23576.	25421.	27859.	30704.	33739.	36740.	40542.
44072.	46371.	47432.	47391.	46477.	44929.	42950.	40696.	38284.	36576.
34941.	33219.	31451.	29669.	27899.	26161.	24470.	22276.	16713.	13467.
11401.	9956.	8853.	7955.	7190.	6520.	5924.	5390.	4908.	4472.
4077.	3719.	3395.	3101.	2834.	2592.	2373.	2173.	1992.	1828.
1679.	1541.	1413.	1295.	1187.	1089.	999.	911.	816.	719.
595.	468.	374.	314.	282.	264.	253.	246.	241.	237.
236.	235.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.
234.	234.	234.	234.	234.	234.	234.	234.	234.	234.

STOR

28.	28.	28.	28.	28.	28.	28.	28.	28.	28.
28.	28.	28.	28.	28.	28.	28.	28.	28.	28.
28.	28.	28.	28.	28.	29.	30.	32.	36.	41.
48.	62.	84.	121.	172.	241.	331.	452.	620.	863.
1218.	1704.	2310.	3063.	4099.	5468.	7065.	8769.	10454.	11955.
13118.	13876.	14225.	14212.	13911.	13401.	12749.	12006.	11211.	10361.
9444.	8477.	7484.	6484.	5490.	4514.	3565.	2672.	2005.	1615.
1368.	1194.	1062.	954.	862.	782.	711.	646.	589.	536.
489.	446.	407.	372.	340.	311.	285.	261.	239.	219.
201.	185.	169.	155.	142.	131.	120.	109.	98.	86.
71.	56.	45.	38.	34.	32.	30.	29.	29.	28.
28.	28.	28.	28.	28.	28.	28.	28.	28.	28.
28.	28.	28.	28.	28.	28.	28.	28.	28.	28.
28.	28.	28.	28.	28.	28.	28.	28.	28.	28.
28.	28.	28.	28.	28.	28.	28.	28.	28.	28.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	47432.	46112.	35899.	15222.	1114733.
INCHES		2.22	6.92	8.80	8.95
AC-FT		22877.	71240.	90621.	92174.

STATION 1, PLAN 1, RTIO 7

273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	274.	278.	290.	312.	346.	396.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
52612.	55028.	56059.	55850.	54659.	52756.	50372.	47684.	44824.	41893.
38966.	36760.	34971.	33128.	31267.	29415.	27594.	25820.	24107.	20870.
15817.	12841.	10926.	9572.	8530.	7676.	6945.	6304.	5734.	5221.
4758.	4340.	3961.	3618.	3307.	3025.	2768.	2535.	2324.	2132.
1959.	1798.	1648.	1511.	1385.	1270.	1166.	1062.	952.	839.
695.	546.	436.	366.	329.	308.	295.	287.	281.	277.
275.	274.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.
273.	273.	273.	273.	273.	273.	273.	273.	273.	273.

STOR

33.	33.	33.	33.	33.	33.	33.	33.	33.	33.
33.	33.	33.	33.	33.	33.	33.	33.	33.	33.
33.	33.	33.	33.	33.	33.	35.	37.	42.	47.
56.	72.	99.	141.	201.	281.	386.	528.	724.	1007.
1421.	1988.	2695.	3690.	5115.	6898.	8923.	11051.	13040.	14688.
15932.	16728.	17068.	16999.	16607.	15980.	15194.	14308.	13366.	12400.
11436.	10465.	9460.	8426.	7381.	6341.	5319.	4323.	3361.	2503.
1897.	1540.	1311.	1148.	1023.	921.	833.	756.	688.	626.
571.	521.	475.	434.	397.	363.	332.	304.	279.	256.
235.	216.	198.	181.	166.	152.	140.	127.	114.	101.
83.	65.	52.	44.	39.	37.	35.	34.	34.	33.
33.	33.	33.	33.	33.	33.	33.	33.	33.	33.
33.	33.	33.	33.	33.	33.	33.	33.	33.	33.
33.	33.	33.	33.	33.	33.	33.	33.	33.	33.
33.	33.	33.	33.	33.	33.	33.	33.	33.	33.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	56059.	54494.	41324.	17758.	1300524.
INCHES		2.63	7.97	10.27	10.45
AC-FT		27036.	82008.	105725.	107537.

STATION 1, PLAN 1, RTIO 8

312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	313.	318.	331.	356.	396.	452.
537.	684.	939.	1340.	1914.	2680.	3680.	5027.	6896.	9593.
13534.	18939.	23748.	26073.	29268.	33153.	37494.	44641.	51221.	56687.
60807.	63795.	65612.	64526.	62293.	60157.	57463.	54414.	51164.	47828.
44494.	41229.	38079.	36129.	34240.	32328.	30424.	28550.	26723.	24956.
23259.	17794.	14008.	11681.	10110.	8949.	8023.	7247.	6573.	5977.
5443.	4963.	4528.	4136.	3780.	3457.	3164.	2897.	2656.	2437.
2238.	2055.	1884.	1727.	1583.	1452.	1332.	1214.	1088.	958.
794.	623.	499.	418.	376.	352.	337.	328.	321.	316.
314.	313.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.
312.	312.	312.	312.	312.	312.	312.	312.	312.	312.

STOR

37.	37.	37.	37.	37.	37.	37.	37.	37.	37.
37.	37.	37.	37.	37.	37.	37.	37.	37.	37.
37.	37.	37.	37.	38.	38.	40.	43.	47.	54.
64.	82.	113.	161.	230.	322.	441.	603.	827.	1151.
1623.	2272.	3160.	4465.	6259.	8440.	10877.	13306.	15474.	17275.
18632.	19477.	19764.	19592.	19122.	18418.	17530.	16526.	15455.	14356.
13257.	12181.	11144.	10111.	9050.	7977.	6908.	5855.	4830.	3838.
2885.	2134.	1680.	1401.	1213.	1073.	962.	869.	788.	717.
653.	595.	543.	496.	453.	415.	379.	348.	319.	292.
268.	246.	226.	207.	190.	174.	160.	146.	131.	115.
95.	75.	60.	50.	45.	42.	40.	39.	38.	38.
38.	38.	37.	37.	37.	37.	37.	37.	37.	37.
37.	37.	37.	37.	37.	37.	37.	37.	37.	37.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

37.	37.	37.	37.	37.	37.	37.	37.	37.	37.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	65612.	62865.	46916.	20295.	1486317.
INCHES		3.03	9.05	11.74	11.94
AC-FT		31189.	93105.	120828.	122899.

STATION 1, PLAN 1, RTIO 9

390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	391.	397.	414.	445.	495.	565.
671.	855.	1173.	1675.	2393.	3350.	4600.	6284.	8620.	11992.
16918.	23212.	25529.	29005.	33491.	39371.	48651.	57437.	67297.	78659.
85011.	87351.	86465.	83261.	78651.	73354.	67848.	62670.	59799.	56556.
53108.	49586.	46084.	42668.	39384.	36859.	34965.	33042.	31121.	29226.
27375.	25582.	23858.	19927.	15234.	12452.	10646.	9359.	8363.	7542.
6839.	6220.	5669.	5174.	4727.	4322.	3955.	3622.	3320.	3046.
2798.	2569.	2355.	2158.	1978.	1814.	1666.	1518.	1361.	1198.
992.	779.	623.	523.	470.	440.	422.	410.	401.	395.
393.	391.	391.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.
390.	390.	390.	390.	390.	390.	390.	390.	390.	390.

STOR

47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	48.	50.	53.	59.	68.
80.	103.	141.	201.	287.	402.	552.	754.	1034.	1438.
2029.	2859.	4160.	6111.	8630.	11569.	14627.	17522.	20030.	21823.
22826.	23195.	23055.	22549.	21822.	20986.	20117.	19246.	18300.	17232.
16096.	14935.	13781.	12656.	11574.	10520.	9457.	8378.	7299.	6235.
5196.	4190.	3222.	2390.	1827.	1494.	1277.	1123.	1003.	905.
820.	746.	680.	621.	567.	518.	474.	434.	398.	365.
336.	308.	282.	259.	237.	218.	200.	182.	163.	144.
119.	93.	75.	63.	56.	53.	51.	49.	48.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.
47.	47.	47.	47.	47.	47.	47.	47.	47.	47.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	87351.	83233.	58398.	25369.	1857908.
INCHES		4.01	11.26	14.67	14.92
AC-FT		41294.	115891.	151035.	153625.

********** ********** ********** ********** **********

PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

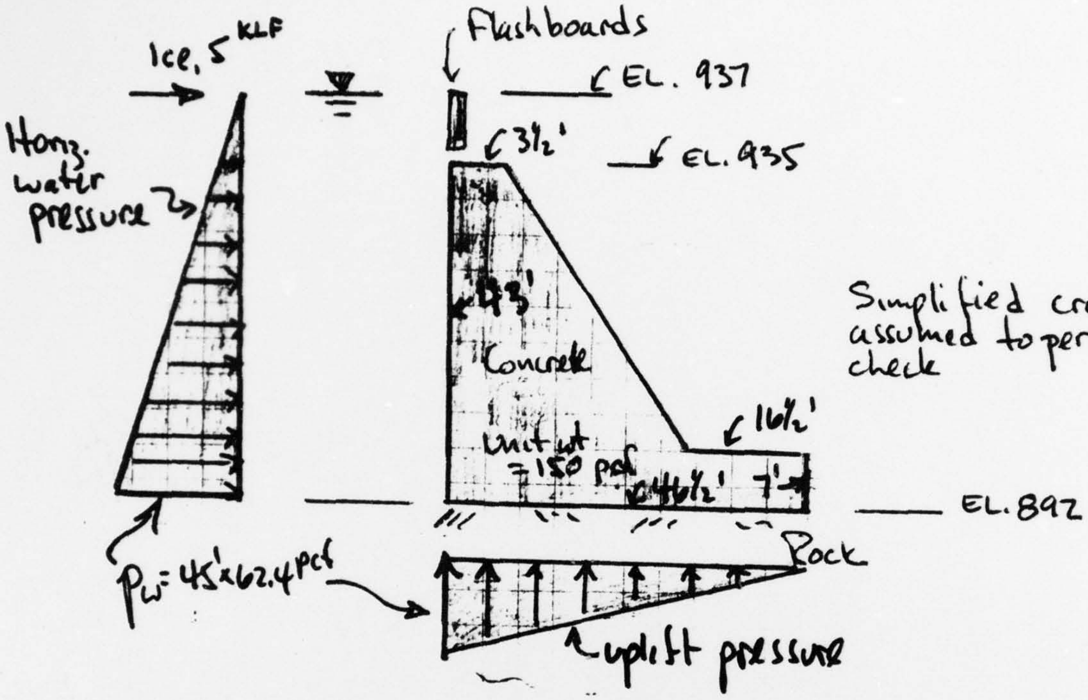
			RATIOS APPLIED TO FLOWS								
:RAT N	STATION	PLAN	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00
'DRO APH AT	1	1	9498.	18996.	28494.	37993.	47491.	56989.	66487.	75985.	94981.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
'TED TO	1	1	9239.	18478.	25369.	31487.	38344.	47432.	56059.	65612.	87351.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.

APPENDIX D

STABILITY ANALYSIS

SALMON RIVER
NIAGARA MOHAWK P.C.

Spillway section selected for checking overturning factor of safety computed in Uhl, Hall, Rich Engineers 1973 report



Simplified cross-section assumed to perform comparison check

STABILITY AGAINST OVERTURNING

Assumed conditions :- WL at flashboard elevation (El. 937)
- Ice acting
- Uplift result from simple hydrostatic pressure at upstream tip of base, varying to zero pressure at downstream tip

Forces causing overturning moment due to horiz. water pressure, ice, uplift water pressure

$$\Sigma M_{toe} = \left(45' \times 62.4^{pcf} \times \frac{45}{2} \times \frac{45}{3}\right) + (5{,}000^{PLF} \times 45') + \left(45 \times 62.4 \times \frac{46.5}{2} \times \frac{2}{3} \times 46.5\right)$$

$$= 948' + 225' + 2034 = 3207^{'k}$$

Forces resisting overturning due to moment of mass of dam about toe

$$\Sigma M_{toe} = (3\tfrac{1}{2}' \times 36' \times .150 \times 44.85') + \left(\tfrac{1}{2} \times 36 \times 26.5 \times .150\right)\left(\tfrac{2}{3} \times 26.5 + 16.5\right) + \left(46.5 \times 7 \times .150 \times \frac{46.5}{2}\right) = 4461^{'k}$$

$$\text{FS against overturning} = \frac{4461}{3207} = 1.4 \pm \quad \text{(with uplift)}$$

APPENDIX E

REFERENCES

APPENDIX

REFERENCES

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